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OUR WONDERFUL
WORLD OF TO-MORROW

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*A Scientific Forecast of the Men, Women, and
the World of the Future*

BY
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CHAPTER I

Introductory—Can the Future be Foretold?

HISTORY, the study of past events, probably ranks in importance after the "three R's" in every school. A knowledge of the world as it is, miscalled "general knowledge," is considered necessary for every child. Until the last few years, no one has ever worried about the future, much less considered it a subject for study. The suggestion that "The Future" could, and should, be taught in schools, generally results in the elevation of eyebrows and a pitying smile which implies, "Of course, every boy reads Jules Verne, but you cannot take that kind of stuff seriously. History is different. We *know* what has passed."

The sceptics notwithstanding, it is becoming the opinion of an increasingly large body of people that the future can be studied with almost as much certainty as this negative history, and that it is certainly more worth while. If we cannot change the past, there is a mild possibility that our own thought may have some effect upon the world of to-morrow. "But how can you tell what is going to happen next year, much less fifty years or a hundred years hence?" I am asked. Perhaps it is easier to suggest what will happen fifty years hence, than to forecast

for next year. Cynics will add that it is safer. But the same applies to history. To write a history of last year is difficult, for we are not far enough away to see events in their right perspective, and the threat of a libel action is always present. The "event" of the year may have been a Great War, yet our children might read only two lines in the history books of fifty years hence, and find a whole page devoted to the discovery, by some now unknown scientist, of a new method of storing electrical power. It is difficult to depict any current events scientifically, owing to the apparent blurring of perspective by the relative importance of events which bear upon our momentary life.

Until recently history has been an affair of wars and coronations. Perhaps the one "date" which every schoolboy and every parent knows is 1066. Yet historians will tell you now that the coming of William the Conqueror to England was of no real significance. Certainly it does not compare in importance with the discovery of electro-magnetic induction by Faraday, the making of the first telescope or the formulation of the theory that the earth revolves about the sun. We all know that a King of France lost his head in the French Revolution, but an event of greater importance, the guillotining of the great chemist Lavoisier, is not mentioned in our book of the past which we may dare to call a glorious history !

In writing of the future it is easier to avoid these mistakes. No man can tell you whether in fifty years the name of the President of the United States will be Smith or Brown. It does not matter. But

it is possible to give a satisfactory idea of how the people of a century hence, or even ten centuries hence, will live. The food they will eat, the clothes they will wear, the cars they will drive and the religion they will follow is of greater ultimate importance than the rise and fall of princes or presidents. Archimedes was more vital than Alexander the Great, and Mahomet more interesting than Haroun.

Writing of the future is not guesswork. If I tell you that you will win the Irish Sweep next year, or that you will marry a tall, dark man, I shall be guessing, and the law will fine me for perpetrating a confidence trick, because no guess is worthy of payment. But if I assure you that two hundred years hence you will find lumps of coal only in the National Museums and that the people of 3000 A.D. will hardly know what smoke looks like, I shall not be guessing. I shall be formulating a progressive theory based on facts as they are known to-day. This is a scientific method. Most people are familiar with the graphical principle of calculation. One factor is plotted on the horizontal lines of your squared paper, and another on the perpendiculars. The drawing of a line or curve shows the relationship between them. For instance, if you know the speeds at which the race for the Schneider Trophy has been won for the last twenty years, by plotting the speed along the horizontals and the years on the perpendiculars, you can obtain a useful idea of the probable speed at which the next speed race will be won. This method applied to the last race gave the winning speed with an error of less than two per cent. ; a result more accurate than

either tipsters or experts could obtain by guesswork or direct technical calculation.

This method can be applied to almost everything in life, and thus yield us a picture of the future. It is obvious that in the case of comparatively vague matters, such as clothes and language, calculations can be made only on the broadest lines. To obtain your records of the past it is necessary to return to the dawn of history. You will remember that an era such as the "dark" Middle Ages may be merely an episode, that according to the latest scientific calculations regarding the age of man and the age of the earth, man is but an infant, muling and puling in his mother's arms. He has lived for something over a hundred million years perhaps, but he has—again perhaps—many times this period yet to enjoy on the earth. He has changed from a being more resembling an animal than man as we know him to-day, into a beast that clothes itself, sets machinery to work for him and attempts communication with other worlds. What will he be like a century hence? We can judge fairly accurately, but when we try to determine what he will be when the world ends, our brains reel. The modern man will compare with his children of a thousand million years hence no more than a fish resembles him to-day. It is a solemn thought and sufficient in itself to make us more interested in the future, to lament the past or even to adopt an attitude of reasonable humility to the present.

But I can foresee this complaint: Do I take it for granted that the world will progress; that there will be no "going back,"? Might not modern man, instead

of becoming a creature made up wholly of brain, revert; and gradually degenerate once more to the ape, a fish, or even a plant? If I take anything for granted, does not my whole scientific basis of forecasting collapse into the guesswork and prophecies of the crystal gazer or the energetic tipster?

While it is possible that you have met some people who strongly suggest that man *may* revert to the ape, and that the progress of the human race is only a hope and not a certainty, I think a study of the past will again correct this idea. There have been periods, such as the Middle Ages, when intellectual development has seemed to stand still, but looked at from the broadest standpoint, these gaps have been quite temporary. They have no more arrested the evolution of man than a fit of indigestion which dulls the brain of a scholar for a couple of hours, can deny this man his final clarity. Much of our knowledge of primeval life is based on the sheerest guesswork, but everything suggests that we have steadily progressed. Black races may have been subjugated by white, yellow may have obliterated brown; empires have certainly risen and fallen, but these have been but ripples on the surface of the great broad stream of advancement. It is the case of a mountain torrent, suddenly dammed by a fallen log. The water is held up for a few moments, only to dash over the top at a speed increased by such momentary setback. I cannot *prove* that man will progress, but I cannot *prove* that white is white or that soot is black. You may wish to hold that coal is red; I say you are wrong, because the remaining 1,850,000,009 inhabitants of the world call this colour

black. But no man can *prove* that any one fact in this universe has ever existed.

If any considered probability should seem wild or impossible, I would remind you that truth is only something which is generally believed. There is no eternal truth, and it is not surprising that Pilate, who knew nothing of scientific methods, should ask the apparently unanswerable question, "What is truth?" At one time it was true that the world was flat, and anyone bold enough to suggest that it was globular, spherical or oblique was considered either insane, or a perverter of the truth.

Our truths, so called to-day, are based on a more secure foundation. The ancients believed the world was flat because it *looked* flat. To-day we use much the same method in establishing our truths; we observe, and from a vast number of observations draw conclusions. It is quite possible that we do not see everything and that many of the results of our sense impressions are quite incorrect. We must expect that the people of 2000 A.D. will laugh at many of the facts which we hold dearest. Fifty years ago the alchemists were the subject of derision. To-day we know that what they attempted—the transmutation of metals—was not only possible, but is likely to be accomplished in the near future. Nowadays the astrologer can find a hearing only in the pages of popular weeklies, where he predicts health, wealth and fame for every one of the readers. But it is possible that our children may discover some glimmering of "truth" in the suggestion that our actions are influenced by the stars. Modern science has

proved the existence of cosmic rays, which, after travelling millions of miles, are still amongst the most potent we know. A sudden pressure of these rays might explain why whole nations are sometimes afflicted by unreasonable insanity, or they might account for changes in individual character or even physical peculiarities of an unexpected nature.

Once we realise that truth is largely a matter of fashion, sometimes even of climate, we can look towards the future with an open mind. We can study developments, especially in such matters as religion and love, logically and unemotionally. Prejudices and unqualified sentiment must have no place in the mind of the scientist. He realises that monogamy might be merely a passing fashion and that the Englishman of the future may have two wives or twenty, according to the circumstances which may arise. He looks into the past and finds that gods have risen and fallen, and he not unnaturally infers that our present gods may suffer the same fate; however eternal may be the idea of localised benevolence.

The most difficult task which befalls the prophet is that of assigning definite times to the events which he believes will come to pass. I am sure, for instance, that we shall discover a cheap and efficient method of storing electricity, which will revolutionise our lives, for it will make available a vast amount of wind and water power now wasted. But I cannot give a date for this discovery. It may be accomplished tomorrow, it may be twenty or fifty years hence. Dates are relatively unimportant over long periods of progress.

Other prophets who have been so bold as to particularise in their forecasts have suffered badly from the vagaries of the inventor. Writing at the beginning of this century, for example, such a skilful scientific prophet as Mr. H. G. Wells gave the date of the first aeroplane leaving the ground as "long before 2000 A.D. and probably before 1950." Less than six years after the ink from his pen had dried, the Wright brothers were flying freely, and long before 1950 thousands of aeroplanes were engaging in combats thousands of feet above the earth. On the other hand, Mr. Wells prophesied at the same time that the "tank" would play a supreme part in the next war. Nearly sixteen years later, the war lords refused to believe it and only tried out the idea experimentally under pressure. If they had read Mr. Wells' book, they might have anticipated the future and won the war in the proverbial six weeks. It is even possible that if attention were given to other more serious prophecies, the world might indeed be made more fit for the inhabitation of heroes.

The forecasts of the vast majority of technical writers have come true. In the realm of pure science, the statements of chemists who have described undiscovered elements in detail many years before they were isolated, have been accurate to an almost unbelievable degree. The method used, of course, was a variation of the graphical system I have described. Tables were prepared which showed the positions and characteristics of the known elements. The periodic curve showed certain so-called elements which were missing, and by skilful inductive reasoning it was

possible to state the properties of these hitherto unknown substances.

When it comes to more commercial matters, the prophet is tempted to give dates, and this is where he fails. How could Mr. H. G. Wells have realised that the perfecting of the internal combustion engine, which was the real beginning of heavier-than-air flying, could have taken place at one certain moment? I foresee a time when power and light will be distributed without wires by ætheric vibrations comparable to those we use for wireless. But how can I tell when the inventor will conceive the continuity of such a missing link, which will lift his invention from the purely academic to the severely commercial? I can no more do this than a man in 1900 could have given you the date when Sir Ambrose Fleming would invent the thermionic valve—the invention which made popular broadcasting possible. But I can say with certainty that the time is coming, and that when it does come it will have a profound effect on human activities, when electrical power distribution will be possible without material objects.

If, therefore, the absence of precise dates is ever noticeable, it is because I have set down only those things which are reasonably certain to take place. I do not believe that the absence of dates can reduce the importance of the future to those of us who have the welfare of the human race at heart. As a general rule, the prophet has given a date too far removed, rather than too near. He has been unable to see, perhaps, how one invention may be of comparatively little importance in its own field, but vital in another.

The discovery of a new element may mean little to the pure chemist, but his commercial colleague may find that some compound of this substance has the property of storing energy in an easily-released form. He may find that it can emanate cosmic rays, and become a weapon more potent than the most horrible death-ray ever conceived by the writer of sensation.

Scientific prophecy is an old idea. The prophets of olden days used to forecast eclipses and other natural phenomena, and by keeping their hearers in ignorance of how their knowledge was obtained, impressed the ignorant by their "personal" powers. I do not seek to impress anyone, and certainly I consider the reasons why particular changes will take place more important than these changes themselves. If we understand the reason for an action, we can alter or modify it according to our needs, or the needs of the future generations. No person can change the positive future, for the simple reason that no one *knows* its cause. But we can observe tendencies and thus make the actual future progressive and useful.

Forecasting the future, still considered as an unimportant subject by a large number of brilliant men who retain their noses in close contact with the academic grindstone, is essential to civilization. The savage never worries about to-morrow. He bridges a river without a thought of what will happen in time of flood. Modern man demands weather forecasts, which are now built up on scientific lines. If we want to know whether it will be safe to harvest a crop to-morrow, we do not look at a magpie and say: "Ah, he is on the left side of the road, so it is going

to rain.” We do not even pay much attention to the cat that is washing behind its ears. We look at the paper and find an estimate, constructed from reports received from hundreds of observers scattered over many thousand square miles. We take it that the result will be reasonably accurate—and generally we are not deceived. If the same attention had been given to the forecasting of the general future as has been given to the weather, many of the mistakes of civilization would have been avoided. There would have been no “economic blizzard,” and although we should be poorer by the loss of a picturesque phrase, we might be the richer in peace of mind.

I can conceive the day when there will be a Ministry of the Future, an institution which will be far more useful than many of the Ministries which have been created recently. It will be the duty of the Minister to collect data from all over the world, to tabulate, correlate, compare and calculate. He will be like a spider sitting in a web, drawing towards him all knowledge, and working out, on scientific lines, the effect that the latest developments and discoveries will probably have upon the human race.

He might find, for example, that while our methods of producing coffee were increasing the yield 100 per cent., our distribution for consumption was increasing only 50 per cent. It would not take him long to forecast that, in the future, coffee farmers would find themselves with huge stocks on their hands. He would not, of course, be so foolish as to suggest their limiting production—that is the way of the coward and the ostrich. He would suggest means of

increasing transport facilities in relation to coffee, and thus ensure that the crop was properly employed.

This is a very simple instance of how forecasting the future may be useful. Again, suppose our Minister of the Future finds that a German chemist has produced a pill which has all the benefits of alcohol without any of its evil effects. He would immediately, should he be able to define the meaning of evil, procure a large number of samples, test them on typical men and women and note reactions. If they were favourable, he would announce that in so many years the consumption of whisky would be almost nothing, and all the millionaires with their money invested in the liquor trade would prepare their plans. Without this forecast, the pill might be thrust on the world and result in wholesale unemployment and unhappiness amongst the thousands engaged in the distilling.

Our Minister will have to be a superman, of course, but he will possess the facts and figures necessary to make his forecasts convincing. Scientists have many times warned the world that it is exhausting its supplies of potash, and that in the near future there will be a real shortage. But the world has taken no notice and continues its wasteful methods. Our Minister of the Future will see that phosphates are not wasted, or that coal is not dissipated into the atmosphere. Matter is indestructible ; it is therefore not a question of a shortage in the world, but of shortage in the particular forms necessary for nourishment or energy to animal and plant life. Our Minister will take steps to readjust the matter "through the usual channels."

It has been suggested that the ancients, when they evolved the well-known symbol of the serpent with its tail in its mouth, had in mind the lesson to be learned from the fact that all matter is indestructible. Matter and energy cannot be destroyed, they can be converted into other forms, including, of course, energy in another form perhaps, such as light and heat. In the far distant future, I can see our international, or interplanetary, Minister, who will, of course, be controlling the whole world, announcing the future distribution of this matter and energy. The world will be far more densely populated. It may be one gigantic city, and it will be essential to maintain the balance of existence.

A Minister of the Future would never have allowed the slums which disgrace the world to-day. He would have foreseen the effect of motor travel on roads and there would have been no need to remake roads every few years to cope with an increasing flow of traffic. He would have demanded grounds for aerodromes within five minutes of reading a report of the Wright Brothers' flight and he would have abolished coal fires, having forecast that they would result in disgusting fog, a colossal waste of energy and the eventual exhaustion of our coal mines.

The appointment of the right man to the job of Minister of the Future a hundred years ago would have made the world richer by millions of pounds. I do not propose to take upon myself in this book the mantle of the Minister. But I can most easily prove that the future, far from being "boy's stuff" to be dismissed with a smile and a shrug, is the only important subject in the world.

What can be conceived can ultimately be created. Everlasting change is perhaps the only relative fact of which we have knowledge. It is the direction of these changes, which must occur in some form, which the world must decide as its one hope for the occupational change called happiness. The only impossibility on this earth is to define the impossible.

Two points perhaps need explanation. I shall write not only of the people of the future, but of their thoughts. In my opinion it is more interesting to know what the men and women who will follow us on this earth are likely to think of ourselves and of the wonderful world upon which we pride ourselves, than it is to know what they will do. Really, these two subjects are the same. We want to know not only how the people of the future will amuse themselves, but what they will think of amusements ; not only how they will bring up their children, but what they will think of our modern methods of development.

I propose to use the expression "our children's children," not referring specifically to our grandchildren, but to our followers on this earth. Genealogists have invented no easy symbol to show a great-great-great-grandchild. To illustrate the exact relationship with us of some of the people I am considering, I should need several pages of "great-greats" before getting to the grandchild ! It would be clumsy to introduce a mathematical term and speak of grandchildren to the 20th. So I shall use our "children's children" to cover people of all future generations, amplifying the approximate date when necessary.

CHAPTER II

Men and Women of the Future

NOW that we have begun our journey into the future, let us look at the men and women who will inhabit the world of 3000 A.D. or later. They are our descendants—children of children brought into this world by children of our children. Will they be different physically, you ask; perhaps remembering that every child is declared to be exactly like his father or the image of her grandmother?

Evolution in man seems to us a very slow process. A thousand variations of a plant can be produced in a single human life-time; sixty years ago there were only four different kinds of sweet pea; now there are many hundreds. But with man, the changes which take place in each generation are so small that we are apt to deny their existence. It may take a thousand, perhaps two thousand years, to make any really noticeable change. Let us, then, look ahead four thousand years.

Ears will still be apparent, sticking out of the heads of the men of the future, but they will not be much used. They may be regarded as useless appendages, and no doubt learned medical historians will tell students that in the dim past these apparently useless pieces of cartilage and flesh used to catch

vibrations of the air, known to the ancients of the twentieth century as "sound." These vibrations were turned into nerve impulses and transmitted to the brain, where they produced effects similar to those now brought about by telepathy. The lecturer will no doubt continue to explain that some of the lower animals still have ears in active use, and that the gradual degeneration of the ears is generally ascribed to the excessive amount of vibration produced by the crude machinery of the early twentieth century. "Our ancestors were driven at one period, apparently, nearly insane by these vibrations emanating from vehicles in the streets. It seems also that they used to communicate with one another by placing their tongues in certain positions and blowing from their lungs. This resulted in air shock, but had the disadvantage compared with telepathy, considered an "occult art" in those days, that it was not selective. Imagine, gentlemen, if a woman entered a public room and began rapidly moving her tongue so as to produce a large number of vibrations of great amplitude! Is it to be wondered at that the ear gradually gave way under the strain, that other methods of communication came into use, and that at last the organ degenerated to its present state, when it is sensitive to vibrations only between the hundred and the hundred and ten per second group?" The students will, no doubt, express amazement after the fashion of their time, that it was possible for men and women to suffer such agonies and survive.

Perhaps this picture seems exaggerated, although

it is, of course, of the very far future. But imagine, for a minute, a fish contemplating the breathing apparatus of a man. Would he not be amazed at the way "gills" had changed? To-day, we carry in our bodies some sixty-eight organs and parts of organs that have, seemingly, degenerated until they serve no useful purpose. The appendix is the best-known example, although fashionable surgeons would probably disagree with me in saying that it has no use. It provides so many with some of their daily bread—and butter.

When you turn round and round and become "giddy," you are being reminded by nature that *you* were once a fish. A fish required a balancing organ for swimming. When fish left the water and took to the land, they carried with them many organs that were no longer quite so useful. This "balancing organ," which can be found near the human ear, consists essentially of a liquid, which, when its owner turns round rapidly, is moved by centrifugal force to produce "giddiness." A fish requires a gyroscope to maintain equilibrium. A man finds it merely a nuisance when applied to some walks of modern life.

These changes have taken place in past ages. It would be ridiculous to suppose that similar changes will not take place in the future. Man has shed his scales, and possibly his tail. He walks on two feet instead of four. Why should we doubt that eventually he will not walk at all, or that his head will become as big as, if not bigger than, his body?

One of the most striking changes which we can

see taking place to-day is in the teeth. We eat softer foods than our ancestors. We do not lie down on the mat and gnaw bones. Our jaws do not have so much work to do, and consequently they are shrinking. I have heard more than one dental specialist state that in his opinion two teeth from each of the jaws will disappear in the course of a few generations. Already very many children have to have four teeth extracted in order to prevent their jaws becoming overcrowded, and in some cases the "wisdom" teeth do not appear at all.

In course of time our teeth will probably become fewer and fewer and the people of the future will regard the appearance of teeth as a sign of low mentality. I can see the fashionable ladies of some thousands of years hence hurrying to the doctors to have a tooth which has had the boldness to appear, removed before any gossiping neighbour sees it and levies blackmail! Women will probably look upon teeth in exactly the same way as to-day they regard excessive hair on the face, and magazines will no doubt carry advertisements for forceps with which teeth can be secretly removed "in the privacy of your own room"!

The changes in the ear, due to the noise of modern life, have already been observed. The effect of long continued loud sounds on the cells of the internal ear has been examined under the microscope, and it has been established that partial destruction occurs. After a period of great agitation against noise, in which many laws will be passed, but never enforced, because they interfere with the material

wealth of the community, nature will probably definitely assert herself and gradually produce human beings who are less sensitive to sounds than are we to-day. From that stage to the complete disuse of the ear it only requires the substitution of some other method for conveying messages from one human being to the next. Even at this moment our ears are less sensitive than those of our early ancestors, and I can imagine an early man being kept awake at night in a modern city suburb by the thud of the policeman's boots a hundred yards down the road!

It is obvious, I think, that men and women of the future will be more sensitive and will react to certain other stimuli more rapidly than do we ourselves. In the age of mail coaches and home factories, agility of mind and muscle was not required, and was developed only by those who devoted themselves to sports. The coming of high-speed vehicles has made "reaction time" an important factor. With every human being a certain time must elapse between the willing of an action and its performance by the muscles. The average time is about 1-10th of a second, which is very fast when you consider the tremendous number of muscles used in such a simple action as lifting a book from the table. But it varies with individuals, and men trained to think and act quickly are very much faster in reaction time than men who have never had reason to practice.

Put a coin on the table between two men, and tell them on the word "Go" to snatch for it. One

man will always get there first. A boxer or a racing motor driver will probably have the coin in his fingers before the ordinary man has moved. Constant practice has reduced his reaction time to the merest fraction, and that is why the apparently "daring" driver is often much safer than the cautious motorist. The daring driver—always provided he is not merely an ignorant fool—moves just that fifth of a second faster than the ordinary man, and in that fifth of a second a motor car travelling at 60 m.p.h. travels 17 feet.

As we become more and more used to machines, our minds will work faster and will transmit their desires more quickly to the obedient muscles. It is largely a matter of habit, and I suppose, mechanically, there is no reason why we should not become one hundred per cent. faster. The men of the future will have to be more rapid, or they will be exterminated by machinery. The average person finds it difficult to imagine a fifth of a second—but to the experienced timekeeper a fifth of a second seems a very long time. Like the stop-watch he holds in his hand, his mind has been finely tuned to distinguish between minute periods. He will ask for appointments at 12.10 $\frac{2}{5}$ p.m. by radio, instead of asking to meet woman AX42Y at the "full of the moon."

Habit will make the men, even of the near future, much less liable to accident from road vehicles. No doubt, in the early days of coaches, country yokels found that these new vehicles moved at a prodigious speed, and were a menace on the roads. Actually, they travelled at about 10 m.p.h. To-day, pedestrians

find the motorist moving at 50 m.p.h. to be a menace. Perhaps the people of the future will protest that aeroplanes should definitely be limited to speeds under 700 m.p.h. !

Those who protest against speed do not realize that it is their minds which are slow, not the vehicles that are fast. The pedestrian of the future—if there are any—will think that a car travelling at 50 m.p.h. is crawling, because he has learned to think in hundreds of miles an hour. Racing motorists slowing down from high speed often think that their car has nearly stopped, when actually it is still moving at about twenty miles an hour. The comparison in speed is so great that five miles an hour seems, literally, like standing still. This shows that the human brain adapts itself very rapidly to new conditions, and I imagine that our followers on this earth will launch protests against vehicles travelling too slowly—because they couldn't see they were moving ! In thirty odd years we have progressed from the red flag man to over 200 m.p.h. What will be the "average speed" even one century hence ?

Machinery will certainly gradually eliminate the consumption of alcohol. The possibility of an ætherial substitute I shall discuss later. It is obvious that men whose lives depend upon the clearness of their brains and the rapidity with which their muscles react, will not take stimulants which even temporarily dull their perceptions and slow their reaction time. Britain is much more sober to-day than twenty years ago, and I think that for this we can thank not so much the Chancellors of

the Exchequer who have levied taxes—for a man determined to have a drink will have one at any price—as the coming of the motor car. Most drivers have the good sense to realize that their own lives and those of many others are endangered by drinking on the road.

Whether high speed will have any effect on the human body is difficult to state with certainty. It is not probable that men of the far future will be “streamlined,” for they will travel, for the most part, encased in heating suits. On the other hand, they will definitely not feel the ill-effects which are now experienced by the ordinary airman at high speed. By indulging in strict training, members of the High Speed Flight (Schneider Trophy) found that the “blacking out” on corners, and sensations of dizziness were reduced. We were told by experts in 1914 that 250 m.p.h. in the air was an impossibility because the human body would not stand the strain, just as eighty years ago doctors stated that 60 m.p.h. would prove fatal to the heart. Yet the 250 m.p.h. mark was passed and man is still pressing on, believing that once mechanical difficulties have been overcome, he can adapt himself to any conditions, secure in the knowledge that speed without change cannot even be detected by the traveller.

The human body is one of the most remarkable “pieces of work” in the world. We abuse it and generally give it little thought. But consider for one minute. Man lives near the poles, where for months the sun does not appear, and the temperature is far below zero. He lives at the tropics, where the

average temperature is far above that of his blood. He lives on high mountains where the air is thin, and he lives in cities enveloped in fog. He is able to dive many fathoms below the sea, where the pressure is several times that of the air. The human body seems capable of adapting itself to almost any circumstances when allowed to participate in the miracle of time. We do not know how great is this feature, for our conscious observation seldom extends for more than 100 years.

The statements of eminent astronomers to the effect that the world is steadily cooling and that in a million million years the temperature will have fallen by 30 degrees Centigrade do not alarm me in the least. I believe that in a million million years man will have adapted himself and be able to live quite happily in conditions that would probably kill us to-day. The savage arriving in a great industrial city often develops lung trouble and dies. Yet children brought up in that city are very healthy and live to old age!

To many people a man of the future would, no doubt, seem extremely repulsive. If you were walking down Whitehall and met a being about five feet high, completely toothless and hairless, with a nose which barely stood out from his face, arms like spiders and legs hardly able to support his body, you would shudder. You would look at his huge head and large eyes, at his frail body and small hands and wonder if this could really be a "Man." It is perhaps fortunate that we can only forecast what the men and women of the future will be like, and not

actually see them. Change, when it is gradual, passes unnoticed; but I doubt whether your thoughts, perhaps expressed verbally in a string of epithets incorporating the words "disgusting," "degenerate" and "revolting," would be very different from those of the ape-man on being brought face to face with the average Englishman of to-day! The ape-man would consider the absence of hair on the body as a sign of degeneracy and, perhaps, indecency. He would ask how a man with such a weak jaw could possibly derive enjoyment from gnawing a bone.

It is essential to see the future in the correct perspective and not to assume that other things will change but that man will remain the same. This is the great mistake made by writers of Utopia. They tell us that men will be more beautiful, according to our present idea of beauty, forgetting that the future standard of beauty may be that of Epstein, who varies from a modern portrait painter no more than "chocolate box" artists differ from those of ancient Greece.

The brain will develop at the expense of the body and the head will have to increase in size, although a big head is not yet a certain indication of its contents. This is certain, that the men of the future will not carry round with them huge stomachs, or beefy legs and arms. They will move from place to place mechanically, and therefore their legs will not need to be developed. Everything they require will be procurable by "touching a button," and therefore the hands will want very little strength. History shows us that when muscles are not used

they degenerate and become smaller. The thumb muscle which man used to work very hard when he was suspended from the branches of trees has degenerated, although I am told by a surgeon that straphanging and bus jumping is leading to its revival!

The men of the future will read our present-day magazine advertisements with amazement. They will find whole pages taken by "strong men" who undertake to make your muscles bulge in a month and they will wonder at the idiocy of their forefathers who were willing to waste hours in bending, stretching, lifting dumb-bells and skipping, when all the exercise necessary to keep the body toned up could be secured by a minute's artificial exercise with a mechanical trainer. They will wonder at the amazing lack of advertisements for schools of mental gymnastics and come to the conclusion that man in the twentieth century had not awoken to the true relative importance of body and mind. I tremble to think of their contempt for our thinly-disguised methods of sex attraction and for scents which help to attract the male in an age of atavistic worship.

When they examine—possibly in the library of the British Museum, records of "typical specimens of twentieth century manhood," they will be disgusted at the portrayal of huge biceps and muscle-knotted chests. "But that man was all body!" they will exclaim, with a feeling of revulsion, just as we would consider a woman covered in hair ineligible for a beauty prize. They will read that men and women, apparently in full possession of their senses, actually conducted competitions to discover who had the

most beautiful body, and that beauty in man was reckoned to be a matter of curves and flesh, just like condition in animals. They will search in vain for any records of competitions to discover the most beautiful mind.

Probably in the not far distant future, men and women will find it necessary to add mechanical aids to their senses. Already our method of living is resulting in an increasingly large number of people wearing spectacles to assist their eyes; at best a clumsy arrangement. If the surgeons of the future do not discover some method of operating on the eye to correct defects produced by strain, then they will most certainly be able to insert minute or contact lenses to correct all deficiencies in the natural vision.

I have dealt with hearing. As I see it, there will at first be mechanical devices to aid our degenerating ears. Even to-day, it is unnecessary for normal people to be deaf. Science can offer corrective apparatus for the majority of cases of deafness. After that will come a period when, by attaching a small mechanism to the ear, it will be possible to select sounds. A filter will reject all noises of a certain type and admit those of another and more desirable type. If, for example, the man of the future wishes to listen to his radiophone, and a pneumatic drill in the road outside is obtrusive, he will simply turn a pointer on his sound filter so that the sounds from the drill are cut off, but the music from the loudspeaker is admitted. This will be an extremely useful device, which I hope I shall see, for I should feel immense satisfaction in taking tea with

Mrs. Bloggins and being able to set my filter so that her silly scandal, poured forth in a never-ending torrent, would be cut off, while the voice of her charming daughter was admitted freely ! It will take many more generations to develop such concentration that mechanical aids are unnecessary to communication or thought.

Mechanical assistance to the sense of smell must undoubtedly be developed. Smoking is generally accepted to diminish the power of smell, and although men and women of the future may not worry about this comparatively unimportant sense, they may find it useful to wear concealed filters when visiting ancient towns. The sense of smell could be stimulated artificially for certain types of entertainment, or even for business purposes. Obviously, if they discover that the odour of sandalwood produces a feeling of well-being and tends to conquer irritability, they will use a sandalwood mask when interviewing difficult clients !

To us, the men and women of the future, with their big heads, ungainly bodies, and their mechanical aids, would seem freaks. I can only imagine what a freak you must seem to an ape or a fish ! While we are living in the present, the past seems " quaint," and everything in the future hopelessly fantastic, ridiculous or indelicate.

CHAPTER III

Sources of Power in the Future

THE people of the future will realize that a cheap source of power is the foundation of material comfort, which, in a state of civilization, is essential to mental development. The discovery of cheap, inexhaustible reserves of power and convenient methods of distribution is, therefore, probably the greatest problem of the immediate future. Unless this source is discovered, most of these prophecies will be unfulfilled. Power will be needed in ever-increasing quantities for aeroplanes, lighting, heating, farming, industry and wireless. Without power civilization would be paralyzed in a few minutes. Trains would stop, lights go out, ships would be wrecked and aeroplanes crash to the ground. The whole fabric of civilization is based on the harnessing of power, for which ever-increasing demands will be made upon the engineer.

How will this need be met? To answer such a question, it must be realized that two important problems are involved. First, the discovery or conversion of the power, and secondly its distribution. Once power is available, it can be distributed in any convenient manner—by means of electric cables, gas pipes, hydraulic mains or mechanical shafts.

The greatest source of power in the world is coal. Experts tell us that the coal supplies of Britain are sufficient to last another 100,000 years. They assume that we shall continue to use it only at the present rate, even allowing for more profitable methods of utilizing the stored energy. Britain is but a small part of the world, and the export of coal, even when feasible, is dirty and uneconomic. I would allow coal in Britain another hundred years of direct use, even less in its present form. I think that long before a century has passed the people will revolt against the whole absurdity of burning coal, pouring tons of soot and chemicals into the air, to form fogs and render life in towns wasteful or unhygienic. Various estimates have been given of the cost of waste caused by soot from coal fires in our cities. Probably one hundred million pounds a year would not be far wrong.

When it is at length realized that coal is the greatest natural wealth of Britain—real black diamonds—the government will forbid its consumption in open grates, or indeed anywhere except in nationally-approved plants. When coal is burned in a domestic hearth, quite fifty per cent. of the energy and all the by-products are lost. The percentage of heat which enters the room is small ; all the valuable by-products, tars, oils, dyes and medicinal substances, go up the chimney, to settle on the land like a blight, stunting vegetation, making the air acid, and turning day into night.

Burning coal will probably become a criminal offence, if indeed, it becomes necessary to legislate

at all. I think it is probable that the average housewife, who is far more scientifically minded than the average politician, will realize how much money she is paying for nothing, long before Parliament takes any real interest in the smoke nuisance.

The power latent in coal will be utilized in several ways. It can be treated at a low temperature, the by-products being removed and the heat utilized for power. The semi-coke which remains will be distributed to the few remaining isolated houses which have no cheap source of electricity and will be used in industry. A certain proportion of the coal will be turned into oil. Experimenters in this direction have met with so many rebuffs that many have begun to doubt the possibility of manufacturing coal-oil on an economical basis. It is possible, however, and most of the failures have been due to insufficient capital or a ready market for the by-products rather than to lack of enterprise. Realizing the importance of an independent source of oil fuel during wartime, some future government will probably take the matter seriously in hand, and spend their money in assisting research workers or establishing plants, instead of paying soldiers to guard pipe lines in other countries.

These are the two chief ways in which coal will be used—either treated by low temperature carbonization or hydrogenation at the pit head, where heat will be immediately turned into electricity and distributed all over the country by cables, or converted into oil for use on motor cars, trains, and boats. It may be found that, while electrification is

very suitable for suburban traffic where stops are frequent and the rapid acceleration an important factor, high speeds can be more economically maintained by oil-fed locomotives for express services. On a long distance express driven by electricity, it is necessary to maintain the current pressure over the whole distance, all the time. Where the electricity is "manufactured" on the train by an oil engine, some of this waste is eliminated. Theoretically about 300 gallons of petrol can be extracted from a ton of average coal, but in practice an actual yield of between 100 and 150 gallons might be realized.

Coal can no longer be regarded as our sole source of power. In a hundred years, cheaper and cleaner sources will be available, and it may be that before the century is out, the miner will revolt against the tyranny of a civilization which demands that he shall live one-third of his life underground, burrowing like an animal. Improved mechanized methods of mining will temporarily alleviate these conditions, for in spite of high wages, it will be realized that for a man, with presumably a brain, to spend his life digging out stones, is sheer waste.

Some method may be found of absorbing the coal *in situ*, thus obviating the necessity of men enduring the misery of underground dangers. Sections of coal may be isolated, allowed to burn slowly, or may be dissolved for fuel as part of some great scheme for the conversion of the store of nature's chemical energy to heat, electricity or mechanical work. At present no practical way of performing this operation is known, but provided the urge were present,

experiments would undoubtedly very soon be successful.

Other sources of power will gradually be utilized, until coal is converted to electricity without the intervention of machinery, or the secret of atomic power is discovered, when our mines may be allowed to fall into disrepair, or be used as bomb-proof shelters with posters to draw the attention of an admiring public to these wonderful examples of British Carlsbad Caverns.

The earliest forms of mechanical power were obtained by harnessing wind and water. It is quite possible that we shall return to the use of wind to a considerable extent. In Holland, windmills are still an important source of power, largely because the land is flat and the miller can rely on some wind almost every day. In other countries where the atmosphere is more uncertain, this power is uneconomical unless some form of storage can be evolved.

We receive in Britain sufficient wind every year to provide us with half the power we desire, but there are many days together of comparative calm, and the wheels of industry cannot be stopped. I think that in the near future serious efforts will be made to utilize power from wind, partly by scientifically-constructed windmills in place of the present clumsy arrangements and partly by storage.

Power will be turned immediately into electricity, which will be stored and drawn upon as required. Present-day methods of storing electricity are clumsy, expensive and inefficient, but the next fifty years may see the discovery of revolutionary principles.

Theoretically, there is no reason why thousands of "ampere hours" should not be stored in a bar of metal a few feet long, but, practically, the problem has so far proved insuperable. The age of electricity cannot dawn until a cheap and efficient form of storage is discovered, so that a whole factory will be able to store a month's power in a small shed. This will enable the people of the future to utilize other spasmodic sources of energy, such as lightning.

The source from which all nature apparently derives its energy is the sun, which emits energy in billions of horse-power every second. A great deal of this radiation is dissipated on its long journey to the earth, but sufficient reaches us to evaporate millions of tons of water every day. Can the heat of the sun be harnessed to provide man with the power he requires? It irritates the scientific mind to think that the greatest heating and lighting generator he knows is available but cannot be harnessed. The sun is as variable as the wind, if less fickle. It shines for an average of a few hours a day only in the winter and for twelve or more hours in the summer. But there are certain places on the globe where the sun is more consistent, and in any case the temperature is high. It is at these points—on the tops of high hills near the tropics—that we will concentrate for our first experiments.

During the next generation, attempts to harness the power of the sun will probably be as crude as those of inventors in the early days of steam. Gigantic mirrors may be again erected to reflect the rays of the sun, and focus them, perhaps, on a small

boiler. It is possible that a small electricity generating plant worked by the heat of the sun will be successful in tropical countries for supplying local power. I believe that some kind of thermo-couple has actually been working for a short period on a farm in Passadena ; the photo-electric method is still quite impracticable. But to supply an appreciable fraction of the world's power, something less clumsy will be required. It may be found that steam is not the best means of converting the sun's radiation, or that some particular vibration band conveys more energy than the heat rays which are at present attracting attention.

In any event, engineers will have to wait for that all-important storage system of electricity, because the power would largely be generated during the day and used at night. An "accumulator" for light will be another possible means of utilizing æther motion. Inventors will seek to find some chemical, or combination of chemicals, which possesses to a high degree the power of absorbing sunlight during the day and giving it out again during the hours of darkness. If they are successful, the elaborate system of wiring needed for electric lights will be eliminated. Your lighting appliance, constructed of this so far undiscovered substance, would simply be exposed to daylight for a few hours and would then shine until exhausted, when it could be re-charged from the sun. More probably we shall explore the secrets of radio power or we shall develop conscious senses which make seeing as we now know it somewhat unimportant. Very little of the spectrum is used to-day for this purpose.

Of this I am sure, that the people of the future will not be content with the variations in temperature and hours of daylight which, north and south of the equator, we endure. They will not be able to prevent the earth's axis from tilting in relation to the sun, but they will store up all the additional ultra-violet rays, light, and heat, received during the summer and utilize them to render winters more equitable or to preserve the balance between their seasons.

Water power will be utilized to a far greater degree than to-day. Wherever water is flowing from one level to another there is a potential source of power. It is interesting to note, by the way, that the real source of this power is the sun, for it is heat which evaporates the water and deposits it at a higher level. Many thousands of millions of horse-power will be so obtained in the near future. Water power could supply the whole of the world's needs at the moment, were it not for the fact that it is not often available where it is most needed. Power cannot yet be conveyed in the form of electricity for more than a limited distance, without great waste.

The main source of "water-energy" is as yet untouched, and as it is available everywhere, it is probably on this fact that the people of the future will concentrate—I refer to the tides. Twice a day the tide rises and falls on every ocean border, and the energy represented by even a moderate tide of, say, fourteen feet, is tremendous. Millions of tons of water are raised fourteen feet and have to return to the original level. The engineer of the future will interpose some form of turbine, so that the

water parts with some of this potential energy. Turbines will be connected to dynamos and an unlimited supply of electricity will be obtained at very small cost after the one initial expenditure of capital.

Many difficulties which have so far prevented the construction of a tidal engine for practical purposes will have to be overcome, but the greatest of all, as with other forms of power, is suitable methods of storage. The power would be converted, probably only during six or seven of the twenty-four hours. During the remainder of the day, the supply would have to be drawn from storage.

The tides offer such temptation to the engineer in search of power, that I think we shall see them gathered even before a new method of storing electricity is discovered. It may be found possible to use the surplus power obtained while the tide is falling to pump water into artificial storage tanks at a higher level. When the tide is at ebb the reserves in the tanks could be released and the stored power utilized. A certain amount of waste will occur, due to friction and similar causes, but since the power source is cheap, it will be found economical.

Mineral oil from natural wells may have a relatively short life, because consumption is rising so rapidly, and the amount available in the earth's crust is limited. It may be found possible to make it synthetically, for its constituent elements are present in vast quantities and easily obtainable. Charcoal, water and the air contain the components of all hydrocarbons. Theoretically, it is merely a question

of re-arranging the atoms. Practically, the task is another matter, in view of the energy which is required to secure the requisite affinities.

The second problem, that of distribution, is perhaps the most important of all. It will be found that, although there is more natural power in the world than man can consume for hundreds of years to come, conveying it to the place desired is another matter. Until the discovery of electricity, power, whether for heating or lighting, was conveyed in the crudest way ; potential light and heat in the shape of tree trunks were carried to houses and burned on the premises, fat and oil were conveyed in cans, a laborious and wasteful method. Mechanical transmission was little used, and a simple shaft or belt could carry the power for, at most, a hundred feet. Every little house had to manufacture its own heat and light, so that the trouble or waste involved implied the rigid restriction of these commodities ; both vital to the whole structure of civilization.

The discovery of electricity made it possible to distribute power for any purpose over an area of several score miles, merely by carrying metal wires from the plant to the desired spot. Recent improvements have made it possible to convey electricity for many hundreds of miles, and it would seem that it is the ideal method. But although it is far better than any other principle known to modern science, engineers will find many drawbacks in the future. They will want to convey power over thousands of miles with comparatively small leakage. They will say : "Here in Labrador we have water-power

giving thousands of horse-power which can easily be harnessed. This power is no use in Labrador, which has a poor climate, but in England, two or three thousand miles away, there are millions of houses that need it for lighting and heating." They will endeavour to bridge the gap, gathering energy where it is most plentiful and distributing it where needed.

In the far future, the whole world will probably be one vast grid, with power being "manufactured" in remote parts and distributed to the centres of industry. Sun-power will be gathered in the great tropical deserts of the Sahara; water-power in mountain regions and tidal power where the wave is highest. It may even be that the Polar regions will supply all we require and, paradoxically enough, heat houses in England.

Wherever there is a difference of temperature, there is a potential source of energy, and it is on this principle that the heat engine works. In the future, I believe engineers may utilize the great difference in temperature between sea water on the surface and sea water on the ocean bed. This would give an ideal power plant for seadromes, anchored in mid-ocean. Polar regions are particularly suited to manufacture power in this way, and when an easy method of transmission is discovered, there may be a scramble for the shares of the North Pole Energy Corporation. At present, no one is very interested in colonizing the Poles, and they are generally regarded as uninhabitable. Exactly the same has been said of Singapore and Panama!

As long as electricity has to be conveyed by wires,

the economic range will be limited, but engineers will no doubt find that it can be conveyed equally well by a stream of electrons through the aether. Each house and factory will have its own receiving apparatus, and wiring may only be necessary inside.

Atomic energy is often quoted as the power source of the future. We are told that the energy in one cubic inch of water is sufficient to drive an Atlantic liner from London to New York and that a gramme of radium would keep it moving at thirty knots for thirty years. Possibly, in the very remote future, some method of harnessing the atom will be discovered, but the idea that an atom can be broken down to release some energy is based on the "something for nothing" principle. For many years it will take thousands of horse-power to break up half-a-dozen atoms, and even when their parts are separated, no way will be known of using the surplus energy. It is not sufficient to have energy—we must be able to employ it and find a convenient way of control so that it can be applied in the required way. The breaking up of an atom is likely to prove far more useful to the synthetic chemist, whose work in the future will be essential to the continued progress of life upon this earth. Power cannot be created. The chemical energy latent in coal, the transmission of gas to long distances by a pipe grid, the sun, falling water or a thunderstorm, all are sources from which we can but select, convert, and transmit power to some spot where it is locally required. It is a problem of commercial distribution.

To forecast the effects of really cheap and easily

controlled power you have but to read the history of water supply. Even a century ago, water was a comparatively difficult commodity to obtain in many houses. Baths were a luxury to be found only in one house in a hundred, and then not often used because of the difficulties of filling. The idea of watering crops, washing the streets or using water without considering the quantity was unknown. To-day, we each use many thousands of gallons of water a year in different ways, and even though we pay a water rate which makes us realize that water does cost money when delivered to the home, we do not think twice before turning on the tap.

It is not that there is more water in the world to-day. There is exactly the same quantity as there was a hundred years ago, but engineers have controlled it and brought it from waste to where it is wanted. Millions of gallons which formerly drained straight into the sea now pass through hundreds of miles of pipes and perform useful tasks before reaching the ocean, to be drawn up once more by the sun and used over again.

So it will be with power. There is sufficient direct power in the world to last the biggest population for millions of years. But it has not been controlled like water. When the age of really cheap electricity comes, notices such as "Please switch off the light when not in use" will be sent to museums. No man will trouble to get out of a chair to switch off the light, because the energy he would expend on this task would be more valuable than the electricity consumed or turned into heat. Movement will

become almost wholly mechanical. Men will probably construct for themselves some simple attachment which will enable them to move rapidly from place to place without wasting energy on using the legs, which as a mechanical device for moving are primitive and wasteful. The whole of man's energy will be devoted towards his brain. Every bodily action will be reduced to an absolute minimum. If medical men discover that a "daily dozen" are necessary for mental health, these will be performed mechanically. The busy man will simply jump into an exercising apparatus, turn a switch, and his limbs will be pulled and pushed through all the necessary contortions without the expenditure of energy on his part. His brain will be so active that he will have no energy to spare for his body. For many years it will be essential to retain parts of our physical make-up in good order so that their disuse may not cause the diseases of waste.

Invention for invention's sake is of no use. Unless it is devoted towards progress, with a definite goal in view, it is lost. The people of the future will see very clearly the main object which we at present visualize but dimly—the ultimate perfection of the human race. They will realize that unlimited power wherever it is required is an essential in the journey towards this end, so that men may no longer be fettered by tired feet, aching limbs and wearied bodies. Material energy so that the mind may expand will be our hope in days when an electric light meter is as rare a sight as a water seller would be to-day.

CHAPTER IV

Air Travel in the Future

THE aeroplane will probably play a more immediate part than any other invention in governing the development of the human race. Already it is possible to leave London in the morning, visit a favourite shop in Paris, and return in good time for tea. The effect of this facility on men and women will be much the same as that of railways and motor cars on provincial villages. The village idiot has disappeared, and countrymen are no longer content with indifferent drains or candlelight.

In the future, when aeroplanes will carry men and women to almost any part of the world for a week-end trip, when it will be possible for the Londoner to have his country house in Kenya or a shooting estate in Kashmir, man's attitude towards his fellow creatures will change very rapidly. Most of the troubles of the world have been due to lack of understanding. You cannot, as a rule, ill-treat or fight a man with whom you stay for the week-end.

When day trips to China take the place of day trips to Southend or Brighton, the Englishman will cease to regard the Chinese as a race of cunning men whose minds are solely occupied with dope, knives and secret passages. In the same way, half-day

trips to New York would enable the Englishman to realize that not every American is a gangster or a millionaire. For their part, the Chinese will soon understand that not every Englishman sits in hotel lounges drinking cocktails all the afternoon.

I give these merely as examples. Obviously, at the same time, the Germans will be exchanging ideas with the Zulus and the Russians with the aborigines of New Zealand. At present, this understanding is possible only for those who can afford comfortably long journeys, and the wealthy are usually too pre-occupied to take advantage of their opportunities.

Air travel is, therefore, of immense importance to the world, and the development of the aeroplane possibly the most important of all recent inventions. What the railway did for Britain, airways and radio can do for the world.

Even the most modern flying machines are comparatively clumsy affairs, not greatly in advance of the canvas and bamboo kite-like structures of the early years of this century. A bad landing can break up the strongest aeroplane, and passenger-carrying machines travel very little faster than trains. Aerodromes have to be stationed outside the big towns, and, at distances under 300 miles, it is doubtful whether the aeroplane saves any appreciable time. Before we begin to realize the value of air travel, we shall have to think of an average speed of 250 m.p.h. and liners carrying fifty passengers and upwards, must be the rule rather than the exception. Flying cannot always be an adventure like riding a bicycle along the top of a high brick wall.

To-day we suffer acute discomfort for the sake of saving a little time, just as a hundred years ago in order to save a few hours on the time taken by a mail coach, men and women were willing to travel in open cattle trucks, behind an engine which belched forth steam and smoke. Men will always be prepared to sacrifice comfort or security for speed, because time is the most valuable thing in life.

One first essential is the elimination of noise. Air sickness has been proved to be largely a matter of vibration and, obviously, a large number of people will prefer to travel by train and boat as long as rising in the air involves nausea and sickness. I would hold out little hope for silent aircraft inside fifty years, were it not for the fact that silence in the air is an important military problem.

It will be found that the elimination of noise, as far as passengers are concerned, is a fairly simple business, once commercial undertakings make up their mind to spend money. The use of a sound-proof cabin for passengers means extra weight, which in turn implies either slower speeds or greater engine power. When once the novelty of flying has passed away, passengers will demand this comfort at any price. The problem of external sound will not be found so simple. Noise from an aeroplane comes partly from the exhaust, largely from the propeller and to some extent from a general "fluttering" of structures. The aeroplane of the future will have no pieces of wire, struts or stays, and will be entirely of metal, with lines as clean as a racing motor car. Noise from the exhaust could be largely eliminated by

effective silencers, but the weight of these would greatly reduce the performance of the aeroplane—an important point from the military point of view. Experiments in the shrouding of propellers have already commenced.

Nevertheless, this noise will have to be eliminated. Men and women could not stand the constant roar of aeroplanes overhead if they made as much noise as our present machines. Conversation in any big town would be impossible and the neighbourhood of a large aerodrome at night, with two or three planes arriving or leaving every minute, would be like a battlefield. I think, possibly, the solution of this problem will arise from a new type of engine and air screw. The exhaust from an oil turbine is much less noisy than that of an ordinary internal combustion engine and the elimination of some of the electrical equipment would undoubtedly tend towards safety in the air.

If definite attempts to silence aeroplanes are not made, then progress will be greatly retarded. The "red flag" men will be able to point to the large number of men and women incapacitated by the noise from above, they will seek for laws making it illegal to fly lower than 10,000 feet over a private dwelling, and they will generally harass the airman.

It has been humorously suggested that the private flyer of the future will not be able to rise because of the weight of the endless licences, log books and records which the Air Ministry will make him keep. Certainly, he has been singled out by officialdom for a vast amount of red tape. How many people would

trouble to keep a motor car if they could be called upon at any minute to produce a log book recording exactly where they had been, where they proposed to go, the number of accidents they had had and so on? Anyone who thinks that this is a flying age should watch passengers being weighed before going aboard a so-called luxury liner! Just imagine if the captain of a sea-going vessel had to weigh his passengers before taking them on board or the psychological effect of forbidding all smoking!

Safety in the air will be another important determining factor. The railways would never have become popular if they could not have boasted that there was less risk in travelling in a first class carriage than in walking down the stairs of your own home. They may yet find this an important weapon in the competition with other traffic. I am not suggesting that flying is dangerous, but as long as the *idea* that it is dangerous persists, it will never become a really popular method of travel. Probably when this is recognized by the governments concerned, they will be exceedingly severe upon foolhardy pilots, who, even when they only risk their own necks, give the impression that flying is a "stunt," rather than a method of transport. It has been cynically but truly said, that not enough people have as yet been killed to bring air-mindedness to the public. We still reckon life in terms of time rather than distance!

The parachute has saved thousands of lives in the air and I think that before many years have passed, a practical parachute for aeroplanes will be found. Instead of passengers having to make a fearsome and

dangerous leap into mid-air, in the event of an accident, a gigantic parachute will be opened to lift out a whole section of an aeroplane cabin and lower it gently to earth. Probably the cabin will be fitted with an auxiliary engine so that some measure of control can be secured in the landing, as the damage done by the actual landing in a high wind might be considerable.

Multi-engined planes will, of course, make forced landings due to engine failure a thing of the past. A much higher margin of power will be used and grounds will be situated at such frequent intervals that dangerous landings in fields will become unknown. Developments in electric power transmission or storage may ultimately solve all problems of reasonable safety in land-cum-air machines.

Before air travel becomes really popular, inventors will have to master the weather. At present, the airman is at the mercy of wind, rain, cloud and fog. Improved weather forecasts enable him to avoid troubles, but, obviously, this is not enough. He must be able to meet trouble and be as independent of the weather as a sea liner. Just imagine the *Mauretania* delaying her sailing because the weather forecast stated that there was a storm in mid-Atlantic! New methods of navigation, greater power and larger planes will conquer the weather. An air service between our main cities would soon convert the public, if roof landing-places were available.

Along every popular air route there will be light beacons on the ground. There may even be a continuous illumination of chosen routes. Householders

may be called upon to pay their quota towards the upkeep of these aerial guides, just as they are now called upon to pay "rates" for the upkeep of the roads. Long distance routes will probably be marked out by beam wireless, the signals being sent in a direct line so that robot pilots can hear the signals and the director know at a glance that he is on the right "road." Any deviation to right or left would result in the signals becoming fainter and disappearing. The necessary manœuvring would automatically bring the aeroplane back to the path again, where the signals would once more be normally received.

An aeroplane of the near future may incorporate some form of helicopter device, probably along the lines of existing design if speed is not sacrificed too far by the use of moveable wings. Instead of being fixed, as in an ordinary aeroplane, lifting surfaces might be moveable and capable of counter-acting a loss of flying speed of the machine. This would assist in the matter of taking off and landing with a "run" of only a few yards and afford some small degree of hovering power. It seems at present that moveable wings reduce speed, and it may be, therefore, that a type of autogyro will be the "taxi" of the future, taking passengers on journeys of 100 miles and under, while gigantic stream-lined aeroplanes or huge gliders that glide over the sea will carry them in comfort over trans-continental routes. The air age will not begin until we have small machines capable of landing in the average back garden or on roofs, for the time wasted in getting to and from aerodromes is appalling and greatly

reduces the advantage of the plane over ordinary land transport.

Long-distance passenger services with our present types of machine will probably never pay, unless further experiments in refuelling from the air are successful. An aeroplane cannot carry a load of petrol sufficient for 3,000 miles with a pay-load of passengers and mail. Non-stop distance flights have their spectacular and experimental value, but they should not lead us to suppose that passengers can be carried in the same way. Four hundred miles seems to indicate the limit of an economic non-stop flight, and with our present clumsy methods of landing and re-fuelling, this means that a journey of 3,000 miles becomes very tedious, especially as night flying is still considered dangerous.

In the near future, I expect to find overland routes being made non-stop by the aid of re-fuelling planes. Probably a special type of aeroplane will be built for this purpose. It will ascend from the aerodrome, fly above the passenger planes and pass down fuel and other supplies without the necessity of a landing. This will mean that a typical trip such as London to Cape Town could be covered in two days, even with our present relatively slow aeroplanes.

For long sea routes such as the Atlantic and Pacific crossings, there will probably be artificial islands or seadromes anchored at convenient intervals; built on the pier principle, so that waves pass through them, instead of dashing against them, these seadromes will be steady in all weathers. Seaplanes will be able to rise and land just as they would from

the ground, and probably each seadrome will have its fleet of re-fuelling planes. The power for maintaining these seadromes may be secured by making use of the tides or even of the difference in temperature of seawater at the surface and at the bottom. Wherever a change in temperature exists there is an energy supply, and if a suitable form of storage for electricity is discovered, the aeroplane of the future may be electrically driven, picking up its power at the seadromes. This would, of course, result in smoother and less noisy flying.

All the developments of which I have so far spoken I visualize in the far future. Certainly a few generations should see them accomplished. Others which are no less interesting and certain will probably take much longer, for flying is quite in its embryo.

The greatest enemy of speed in an aeroplane, as with a motor car, is the friction of the air. At high speeds nine-tenths of the power of the engine is being used to overcome air resistance and only one-tenth to propel the machine. The higher the speed, the greater the resistance of the same-sized surface; indeed, the resistance rises as the square of the speed. Great efforts are being made to reduce the size of the surfaces offering resistance to the air by stream-lining and moving chassis, but experts have long realized that the real solution lies in travelling up to the higher regions where the atmosphere is very rare. Thirty miles up, the air is only one thousandth as dense as at sea level and, therefore, other factors being equal, the ordinary aeroplane would travel thirty times as fast with the same

amount of power. New York would be reached in one hour, instead of in thirty hours. Unfortunately there are other forms of loss which are, as yet, inherent to high-speed travel in the upper air.

An aeroplane depends for its motion on the "grip" exercised by the propeller or air-screw upon the air. The machine is either pulled or pushed by the screw travelling through the air. If there is no air, or very little, the propeller cannot be effective and slip becomes exceedingly high at all times.

Up to certain heights, adjustments will still give the necessary reaction; by increasing the diameter of the propeller, and gearing the engine, the aeroplane may be kept in flight due to its forward motion. This has been done with the aeroplanes which have risen to heights greater than Mount Everest. But there is a limit or "ceiling" for the aeroplane, even with a variable pitch air-screw. Beyond this point the aeroplane will not rise, through lack of "grip" and lifting surfaces. The air passenger expresses of the future may take advantage of the lessened resistance at great heights by employing super-charged engines, and special propellers, but the real era of fast travel may begin with the rocket plane.

A rocket does not require air against which to push; it could, therefore, travel in the stratosphere, thirty miles above the surface of the earth, as effectively as at sea level. Because of the lessened resistance, very little power would be required to propel it at speeds of 1,000 m.p.h. and upwards. The rocket aeroplane will ascend slowly to this higher region, gradually accelerate and then cover

the major part of its journey across half the earth in a few hours, descending again more slowly.

Many bold experimenters are now at work with rocket aeroplanes, but a suitable fuel has to be found, methods of control established, and navigation in these regions, far above earth, learned. Fifty years of continuous experiment will probably be necessary to produce even an experimental plane working on these principles.

Will the human body be able to stand the strain of travelling at 3,000 miles an hour? That is a question which has been asked many times. Twenty years ago it was doubted if man could stand the strain of 200 m.p.h.

We will take it for granted that rocket planes must be equipped with the breathing and heating apparatus which is essential at great heights, where the temperature is 75 degrees below zero. Curiously enough, in the stratosphere, although pressure continues to fall with increasing height, temperature remains constant for a considerable distance. It is the effect of rapid acceleration and turning at high speed which represents the danger to the human body. The rocket plane will have to ascend comparatively slowly, but even at 400 m.p.h., a speed which we know has no harmful effects, it would reach a height of thirty miles in a few minutes, and it could then accelerate quite rapidly to 3,000 m.p.h. Passengers might experience some feeling of discomfort during the short period of acceleration, but probably little more than in an express passenger lift. They would certainly have no feeling of speed. Through the

glass windows of their passenger cabin only the stars would be seen, and since they would have no other object with which to compare their rate of motion, they would probably imagine themselves to be standing still. In a railway station, when two trains have stood side by side and one starts off, it is often very difficult for passengers in them to say which of the two is moving. Very often, those in the motionless train believe that they have started.

Once it was moving at a high speed, the rocket would be unable to do much manœuvring, as the effect of a turn at 3,000 m.p.h. might be to burst the bodies of the passengers. Even racing motorists travelling round a circular track at the low speed of 120 m.p.h., wear body belts to help them resist centrifugal force and vibration.

Rocket air expresses would have to be enormously strong, for, obviously, the pressure inside would be many times greater than that outside. By hermetically sealing the plane before it began a journey, the pressure would be kept at that of sea level, even when the external pressure was only a fraction of an atmosphere. The rocket might also have to use some form of net for protecting itself from small meteorites, which are far commoner in the regions outside the normal atmosphere than below, for the effect of a meteorite striking the hull of a plane might be disastrous. There would, perhaps, be an explosion, and certainly a fire. This may prove to be one of the biggest problems of the rocket flyer, for, although the chances of being struck are small, the results, with both bodies travelling at high speed,

would be terrible. Some form of magnetic protection may be used, so that the rocket would be enveloped in an invisible net of repulsion.

When rocket-plane passenger services are established, the world will seem a very small place. It will be quite possible for a man living in New York to work in London. His journey to his office will be little, if any longer, than that of thousands living in the suburbs of big towns to-day. People will cease to talk of "foreign travel," because no country will be more than two or three hours' journey from their own. It may become fashionable for Europeans to dine in quaint Chinese restaurants, or take an evening trip to the North Pole to see the aurora,

The effects of high-speed travel upon the customs, morals, and peace-loving propensities of the whole universe will be incalculable. With Diesel-engined, all-metal planes as the forerunners of real air liners, most of our parochial ideas will be superseded, while the ability to remain in touch with home during the farthest flight will do much to remove the abiding terror of travel which isolation has planted so deeply in all living creatures.

The speeding up of life is the greatest sign of that perpetual change to which all things material are subject. How will it remain possible for us to fight so bitterly together in an age when world war has become civil war by intermarriage or when a united defence may be necessary to cope with invaders from other planets? Inexpensive tours between the Congo and London will have an astounding effect upon personal habits and the laws of marriage.

CHAPTER V

Interplanetary Travel

WHEN the history of interplanetary travel comes to be written some thousands of years hence, we shall no doubt be told a pretty story about a boy who, discharging rockets on the Fifth of November, asked his father, a noted scientist, "Father, would rockets travel in a vacuum?" The father, after the manner of parents, would be anxious to appear all-knowing and therefore replies, "Of course not, son," whereas, in fact, he does not know. The little boy in the story, being like all boys, unwilling merely to take his father's word, goes on to experiment in the subject to find that rockets *do* travel in a vacuum, just as easily as in air.

We tell a not dissimilar story about Watt watching a kettle boiling on the hob and observing the force of the steam. It is probably equally imaginative, for steam engines were dreamed of many years before Watt was born, and rockets fired centuries before men began to consider their possibilities for passenger carrying to other worlds.

During the next century or two, experimenters with rockets will undoubtedly have to put up with a good deal of ridicule. To the unscientific, experiments with rockets which fizzle out, do not rise, or

send the car crashing into a wall, seem very ludicrous. The same type of person would, no doubt, have laughed uproariously if he had been present at the historic experiment when chloroform was breathed for the first time by a gallant band of experimenters.

Gradually, as rockets become more perfect and actually rise a mile or two from the ground, coming down at a slow speed and landing their pilots in safety, people will take notice. But I do not doubt we shall have our "red flag" men fifty years hence, just as we suffered a hundred years ago in the early days of railways. It was seriously argued in Parliament whether railways should be allowed because of the terrible effect they might have on the wives of farm labourers who, terror-stricken, saw them pass!

The "red flag" men of the future will, of course, insist that no rockets shall be allowed to rise except from the centre of the Sahara, when in the event of an accident no one would be hurt except the foolish scientists aboard. The twenty miles an hour speed limit was insisted upon for motor cars over a period of many years, to the lasting detriment of our own automobile industry. This limit was imposed when cars could travel very little faster. Yet it was a very long time before the prejudiced brigade would make it legal to travel at higher speeds. The fact that motorists could, and frequently did, journey in perfect safety at 60 m.p.h., worried them not at all.

Once these early stages are over and enough people have been killed to make us "rocket minded," this form of travel may develop very seriously.

Obviously, the first stage, long before voyages to other planets are undertaken, will be to use propulsion rockets for journeys over the earth. During this period, space travel companies will advertise trips to the stratosphere "to see the view." They will take parties up to a height of thirty miles above the earth, where they will be able to see, from the comfort of their cabins, the stars bright in a background of black, the earth, on a clear day, as something apparently on the horizon of nothingness. But thirty miles is a mere trifle when we think of journeys to the planets. Nevertheless, I expect that the rocket capable of ascending thirty miles with passengers will rapidly develop into the interplanetary type, cruising the 250,000 miles to the moon.

An expert on rockets has recently calculated that a machine suitable for travelling to the moon would have to weigh about a million tons, but I think his calculations are based on the assumption that only known fuels will be used. Using such comparatively inefficient fuels as liquid oxygen for our propelling rockets, we should need a tremendous fuel storage space; but I believe that other fuels will be found, or other methods of storing energy discovered.

Early pioneers in the stratosphere, for example, may find that the cosmic rays which are almost completely cut off from the earth by the atmosphere, can be harnessed and used to supply energy. Again, sunlight may be turned into a suitable form of power. Of so-called "atomic energy" I am not so optimistic, but of this I am certain, that although

the question of a suitable fuel may delay progress for some time, yet in the end scientists will conquer. Aviation in heavier-than-air machines was retarded for many years entirely for the lack of a suitable motor. The invention of the internal combustion engine solved at one stroke half the problems with which early experimenters had tried to grapple. No doubt the rocket experiments which will be made between 1935 and 1945 will seem as clumsy to the fliers of the future as the balloons with steam engines aboard, employed by early airmen, appear to us. We must not forget that the world laughed when some years before the Great War a daring experimenter built a multi-engined aeroplane for crossing the Atlantic, and it was found that this machine had to be broken up because it would not rise.

A completely new type of airman will gradually be developed for interplanetary travel. He will have to navigate in space as the modern sea captain guides his ship in mid-ocean, and he must, undoubtedly, face conditions which we can only imagine. Minute calculations regarding the force of gravity, the effect of sunlight on his space-ship—for light has weight—the movements of planets, the approach of large meteors and a thousand other difficulties show that the first men to venture far into space will indeed be bold. But they will go; it will be as necessary to them as was the discovery of the American continent to Columbus.

That hundreds, and even thousands, of lives will be lost before space is conquered with a rocket-ship is probable. Many people will talk about the “wicked

waste of life " and urge that rocket flying shall be prevented by legislation. But life spent in endeavouring to secure progress is never wasted. It is because countless thousands have been lost at sea that we to-day can travel comfortably in a luxury liner. Many hundreds of men and women lost their lives in the *Titanic* disaster, yet the lives of many more thousands were thereby saved. Man can only learn by experience and experience must be bought. The scientist blown sky-high from his laboratory and the victim of a pit disaster, both contribute their share to the well-being of mankind. Others learn that disaster follows a certain experiment and are warned. The public are shocked by the pit disaster, and insist upon the latest scientific knowledge being applied to reducing the general risks of mining.

Whether life exists on the other planets or not, is a matter upon which future astronomers will pronounce. It is not sufficient to say, "The air round Mars is so thin that no life could exist." The density of the air only tells us that no form of life as we know it on *this* earth could exist. Our followers on this earth will not be so vain and egotistical; they will realise, for example, that the fact that we "see" a picture and "hear" a sound, instead of "seeing" the sound and "hearing" the picture, is almost an accident. A minute difference in the construction of our eyes would enable us to see through brick walls, but be unable to penetrate a shop window! The exact wave-lengths with which we "see" are small in number. It would be foolish to suppose that other creatures do not utilise other wave-lengths. All our

scientific laws are based upon observation of earthly conditions. Totally different circumstances might exist on Mars or any of the other planets. Future fliers may even land on the planet and spend months there before they "see" thought forms of the original inhabitants or they may only be able to do so by means of special instruments. Supposing their largest material living and sentient creature lives so slowly that we cannot visualise its movement, so fast that it is invisible, so small that twenty million could stand on a sixpence!

It is most important to realize that vibrations vary enormously in type and wave-length, but are basically the same. It seems as if in the course of creation, living things have said, "Here is a group of wave-lengths. We will 'see' by them, as they excite certain organs. Here is another set, we will 'hear' by them as they make a stretched skin vibrate; and all these vibrations can be turned into thoughts." Remember that it is only comparatively recently that certain oscillatory frequencies have been "discovered." The waves of wireless, X-rays and so on, all existed for centuries before we perceived them in any way. There are probably many other types of vibrations which at present we do not understand and cannot detect.

All writers of fiction whose stories deal with interplanetary travel seem to take it for granted that any form of life on another planet would be inferior to our own. There are exceptions, and if the imaginary Martians of thirty years ago seem rather crude to those who have grown up in the inventive

age of warfare, the principle of superior intelligence may be quite logical. Indeed, it is only the vanity of man which leads him to suppose, in general, that he must be the first visitor to Mars. There may already have been callers from other planets, or, indeed, it may be that Martians will visit us before our rockets have risen twenty miles from the earth. It would be difficult to prove that they are not with us already, regarding our efforts with the interest of a bacteriological expert for his latest culture.

It is comparatively easy to let the imagination run riot with tales of future interplanetary travel. The date when these journeys will be an everyday affair must be placed very many centuries ahead. We are still in the stage-coach era of aeroplane travel, we have not begun to think in terms of space. The mathematical problems involved in calculating the flight of a shell from a battleship to the target twenty miles away will seem as simple as the multiplication table when the time arrives to plot the course of a rocket travelling to the moon. That pioneer of imaginative literature, Jules Verne, made appalling blunders, even though he had a free hand in determining the size of his projectile and the explosive.

One of Jules Verne's mistakes was, of course, to assume that the space-ship would have to be shot from the earth like a projectile. To leave the earth at all, the initial or "muzzle" velocity of a shell would have to be five times that of "Big Bertha," the famous gun which bombarded Paris. Even then, the missile would not travel towards the moon, but would become a satellite of the earth, to travel

round unendingly. An initial velocity seven times as great would send the projectile into space, free to travel according to the laws of gravity.

Obviously, the space-ship of the future must carry its own motive power and will also require some sort of steering apparatus. The answer of the experimenter to every question may be "rockets." To turn one way he will discharge starboard rockets, to turn the other, port rockets. To slow down he might discharge "reverse" rockets, and so on.

Experimenters will soon lose the "rocket" idea and call their apparatus "an engine." A rocket implies a sudden explosion of definite time limitation. Strictly speaking, perhaps, we could say that an internal combustion engine is a series of rocket explosions, the "push" being harnessed to a piston. But to produce combustion lasting five minutes and a simpler burning to last ten days, the time required to reach the moon at a speed of a little over 1,000 m.p.h., are two very different problems.

The question of heating alone is a matter of extreme importance. It is believed that the temperature of space is very near that of absolute zero, the lowest temperature possible, or about 492 degrees below zero! One obvious solution would be to have the space ship built on the principle of a vacuum flask, but this would add enormously to the weight and complicate the matter of control. The smallest leak could not be permitted from surroundings which would turn air instantly into a solid and burn flesh like a white-hot iron.

Before voyages to the planets are undertaken,

attempts will probably be made to get into communication with the inhabitants, if any, of other worlds. Provided some intelligible means could be established, we should be able to find out whether conditions would tolerate our form of life, and what precautions in the way of pressure suits, breathing apparatus and so on, would be necessary on arrival. The language in which we could communicate would not present such an insuperable problem as might be supposed. Man will be very much further developed before he bridges the great distances between our world and other planets, and he will probably have acquired the knack of sending direct "brain pictures" without the intervention of mouth wagging words or sounds. A thought is little more than a mental record. We put it into words because we do not know how to communicate any idea to our fellow creatures without symbols. But it is interesting to note that the thought may also be expressed in sounds or music, and that to the expert this may convey the sense more effectively than the written word. Another method of communication is the picture. Words, pictures and music may all give the same meaning in different ways. What a saving of time and energy if we could transmit the thought direct! This faculty will undoubtedly be acquired by men as their brains develop. Telepathy is now more or less accidental, but there is no reason why it should not be deliberate and controlled.

Probably, the first signals to Mars will be made in some comparatively clumsy form, such as a gigantic smoke screen. Through our telescopes we are able

to watch changes on the face of the planets, and it is possible that the people of the future, by producing smoke over a huge area, will try to make some alteration in the appearance of the earth. If there are inhabitants on Mars and they are intelligent beings, they probably have already noticed the change that takes place every spring. They would be able to see a smoke screen of sufficient size and answer in a similar fashion, probably marvelling at the primitiveness of life on the earth which made necessary such ignorant forms of signalling. Our difficulty is that the recipient of these signals might show no more interest in them than would an earthworm in the brightest of musical comedies. An excess of intelligence may prove as awkward to overcome as is the lack of æsthetic appreciation to a modern artist's public.

At a later date, signals by means of radio may be tried. Some experiments in this direction are being conducted at the present moment, but they seem spectacular rather than scientific. Our existing knowledge suggests that the wireless waves we employ are turned back some miles above the surface of the earth by the so-called Heaviside layer. It may be, of course, that wireless waves, like light, have mass, and the layer which is at present imagined to be an impenetrable barrier is no more than the result of gravity. Wireless signals to pass beyond the influence of the earth would either have to be extremely powerful or possess different characteristics from those of normal light.

It may be found that while the ordinary long waves used for broadcasting and communication on

the earth are stopped by the Heaviside layer, ultra-short waves will penetrate and pass into space. It may prove easier to send messages which we believe reach the planets than to receive a reply, but providing the inhabitants are intelligent, they would probably send their answers on approximately the same wavelength. It is not impossible that a very advanced type of life, such as may exist on the older planets, could send signals direct from the brain, without the intervention of valves and other apparatus.

Some years ago a message was given to be transmitted from the Rugby station and intended for Mars. The Post Office, with characteristic efficiency, marked it "Delivery not guaranteed"; and judging by our present knowledge of the penetrating power of the waves on this length, the authorities were accurate.

I have endeavoured to make clear the, at present, insuperable difficulties of interplanetary travel or communication. But to realize these obstacles is the first step to accomplishment. No one doubts that serious attempts will be made to reach the planets, first by signals and then by space-ships; few doubt that, ultimately, they will be successful. "Ultimately" may mean in one hundred years or ten thousand years. Even the longer of these periods is very short compared with that required for the development of man and his probable length of life upon the earth.

Why, it will be asked, should the people of the future worry about reaching the planets? The world in their time will be a better place and more comfortable by our standards. Why should they

risk their lives in seeking for other spheres which may be inhabitable only under rigorous conditions ?

There are many answers to this question. One is man's thirst for knowledge. For centuries we have left the comfort of our armchairs to seek the unknown. The mere fact that something is unknown is a challenge to the scientific mind. I cannot believe that the people of the future will be different.

The lure of money is another motive force behind many adventures. Probably, in the future, wealth will be estimated at its true value, but the fact that the planets contain much larger quantities of certain rare elements which might be very desirable to this earth will certainly stimulate the more adventurous. Just as hundreds of years ago, men sailed in cockleshells across the Atlantic in search of gold, silver and spices, so in the future they will brave the unknown to find radium, helium, and other rare elements.

A third, and very possible, reason for interplanetary exploration is economic pressure. This may take the form of over-population, which has nearly always been the motive force of emigration in the past, or it may be, I suggest, the knowledge that some dreadful and final disaster threatens the earth. Perhaps a small body of people will become discontented with their condition on the earth, and, surgeons having failed to cure their malady, they will decide to found another civilization elsewhere. It would only be the sailing of the *Mayflower* on another scale, into another relative direction.

How many space-ships will be wrecked and their pilots killed we can only guess. If it were a question

of disaster threatening the earth, and emigration to another planet the only method of ensuring the survival of the human race, I think the people of the future would consider one successful voyage in a thousand to be a reasonable alternative. If we regard the prodigality of nature when it comes to survival, this must be considered a high average. Even in the case of human beings, millions of life cells are wasted and die in order that one may do its work. A plant scatters thousands of seeds ; it is sufficient if one per cent. germinate. Of the survivors, the vast majority are destroyed before they reach maturity and only one, in its turn, flowers and distributes its own seeds, for the same apparent waste to continue. But the waste *is* only apparent. Nature will pay any price to ensure the survival of a species, and the urge in man will be the same, though speeded up to suit his place on the scale of time.

Some scientists, unable to visualize changes in their certainty, dismiss the whole question of interplanetary journeys with a shrug and a laugh. Astronomers can produce calculations to show that such journeys are "impossible" ; as hopeless, in fact, as was heavier-than-air flight proved to be by elaborate calculations in the last century. In any case, if we are entirely wrong in thinking that our children's children will attempt to explore the solar system, speculation on the subject is excellent exercise. Man is apt to think that he is an ultimate creation. He cannot conceive a higher form of life, or even a very different form of life. Yet the whole solar system is but a minute fragment of a far greater universe.

CHAPTER VI

Motors and Motoring

MANY people believe that the advent of the aeroplane meant the end of all motoring, but although flying travel may eventually supersede road travel, I think many years, perhaps a century, will pass before the ordinary motor car disappears. At the same time, I realize that changes like this may be made very much more rapidly. At the beginning of this century, it was suggested that in twenty years we should have a horse cab in a museum. Actually, this event took place almost immediately. Some great discovery which will simplify air travel may hasten the end of the motor car or produce a combined vehicle, but for journeys of less than one or two hundred miles, it is likely that the mechanically-propelled road vehicle in some form will long hold its own.

The development of the motor car will follow similar lines to that of the aeroplane ; indeed, research in one method of travel has usually resulted in benefit to the other. The greatest debt of the aeroplane to the motor car is, of course, its engine. The motor car owes to the plane nearly all modern methods of streamlining, the great importance of which was first realized in air travel, where speeds are high,

“ Greater speed and greater comfort ” will be the slogan of the car manufacturer for years to come.

Real comfort will be secured in a number of ways. The most important will probably be radical changes in engine design. Except in such comparatively small points as methods of ignition and carburation, the motor car engine has not radically changed since its beginning. That is to say, the engine is still essentially driven by the quick burning or “ explosion ” of a mixture of air and petrol vapour ignited by a spark. Obviously, as long as there are a series of explosions, perfectly smooth running is improbable. With a luxury car, the effect of the localized pressure is minimized. A large number of cylinders—twelve or twenty-four—are installed, so that the gap between each explosion is reduced and the effect is more that of one continuous pull rather than a series of jerks. But this type of engine is a luxury, not only as regards original cost, but also in fuel consumption.

The men of the future will demand this luxury without its expense. There is still sufficient novelty and convenience about motoring to make men and women put up with a great deal of discomfort. This will shortly disappear, for motorists are beginning to demand the same ease on the road which they would enjoy when sitting in their own armchairs. At the same time, they will ask for greater speed, and the young men who now tear down our roads in “ sports models ” will probably have taken to the air, leaving behind them congested roads and motorways for a generation of travellers who will find a marked similarity between railroad and car track.

The introduction of the Diesel or semi-Diesel engine may provide a smoother motive force, and incidentally far more power for the same money. The Diesel will be started by an auxiliary motor, and run at a constant speed. Control will probably be electrical, so that driving will be as simple as in the case of a tram car, but without one hundredth part of the present physical effort involved. A single small lever will take the car from a standstill to its highest speed, and there will be no ordinary gears to puzzle the bad driver or, as they crash into place, grate upon the ears of pedestrians.

Engines will probably be put in their proper position—at the centre or back of the car. The idea of an engine in front is largely a legacy from the days of the horse. Early cars were built on cab principles—just as the first railway carriages were modelled on the old stage coaches. Perhaps, to-day, the old and new do not seem to have much in common, but in actual fact designers have never been able to shake off the effects of tradition.

The idea of having an engine as far as possible from the drive to the back wheels is, from an engineering point of view, ridiculous. That power has to be exerted upon the wheels at all is largely due to the inefficiency of air screens which one day may be improved out of all recognition, enclosed in wire-netting to ensure safety, and mounted upon a run-about free from all present complications.

When a car is running at high speed, the sparks in the cylinders are made at such short intervals that they are, for practical purposes, approaching con-

tinuity. The motor car of the future may operate under a system of continuous combustion, with the engine always turning at high speed and the necessary gearing down electrically controlled. This in itself would make for silent and smooth running, with elimination of the vibration which is usually felt in any but a luxury car.

Existing types of internal combustion engines are contradictory to a degree in design. Their chief claim to popularity is the ease and cleanliness with which the chemical energy of the fuel may be turned into heat or the excellence of the systems by which petrol is distributed.

Inherently, the "explosion motor" is unsuited to purposes of traction, for it possesses no starting torque; it must run at high speeds to ensure that the heat is not all lost by radiator and exhaust. The burning or explosion must be rapid to prevent there being time for heat losses to occur, yet the expansion should be slow so that the piston may take up heat by driving the car.

High engine speeds mean gearing losses, while high compression implies quick ignition and the possibility of knocking, which can be avoided in most designs only by using slow-burning fuel.

A carburettor does not give a perfectly gaseous mixture which will ensure complete combustion, yet a "wet gas" is desirable to prevent the flame of explosion from being so rapid that it cannot be followed by adequate piston movement. Even this gas must be cool, so that the weight of mixture passing through the engine may not fall too low.

SAVED BY THE ENGINEER

It is for these reasons, amongst others, and the expense of building engines to run fast at the high compression ratios essential for fuel efficiency, that superchargers or self-ignition motors are becoming so popular. Largely for the sake of comfort, the engine of to-day operates at an inefficiently low compression. It is only by the greatest care in design that we can expect to bridge over the period of change through which all motor cars are passing.

General chassis and bodywork conditions are equally strange, for at any speed over sixty miles an hour, the average car uses much of its power to overcome wind resistance. Even a headlamp, which at low speed offers very little resistance, may require one horse-power to drive it through the air at 100 m.p.h. Streamlining will, therefore, be of paramount importance, because, when cars are built upon scientific lines, it will enable much higher speeds to be attained with the same power. Hitherto, coachwork has been designed mostly to please the eye. The owner of the future will require technical accuracy rather than beauty, and the sight of a stubby radiator offering tremendous resistance to the air will have the same effect on the man of to-morrow as a cubist picture has on a royal academician of to-day.

There will be no extraneous parts on the outside of futuristic automobiles. The radiator, of course, will be behind—there is no reason why it should not be in the roof, just as in aeroplanes, where the large wing surface provides convenient cooling. Perhaps oil instead of water will be used for getting rid of heat which cannot be used with the new metals then

employed. All headlights, spare wheels, tool boxes, radio, driving mirrors and so on, will be incorporated in the design of the coachwork, so that there are clean lines from front to back. Even the mudguards will be streamlined, just as in the latest type of aeroplane the landing wheels are screened by covers.

The coaching influence can still be found in the size of motor cars. During the last few years manufacturers have shown more enterprise and a greater variety of motor car sizes have been introduced. But even now, the average distance between the wheels of a motor car is that between the tracks made by a farmer's cart, which in turn is the same as that made by Roman chariots as they crossed the muddy roads of ancient Britain. The motorist of the future will demand greater luxury and more room.

His long-distance tourer may contain not only ordinary seats, but sleeping couches, perhaps a dining table, and certainly facilities for washing. In such comfortable surroundings, he will be able to make journeys of many hundreds of miles with a minimum of discomfort. He will, of course, insist on a wireless installation, not only for listening to the broadcast programmes, but for keeping in touch with his home. The business man may leave his office at nine in the morning, dictate his letters by wireless to his secretary while travelling to Manchester, sign them by telewriter on his way to Glasgow, having checked them by television, and spend his afternoon fishing or golfing in the North of Scotland, returning home during the night. A little later on, and radio rejuvenation treatment will take the place of games,

which will be considered as crude as we to-day think cockfighting.

Small cars of greater speed and rapid acceleration will probably remain popular for some time for conveying their drivers to and from aerodromes and arterial speedways. It is obvious that there can be no very great speeding up of motor cars until special highways are built. The present roads are, except in a few instances, again bound by farm cart history.

Pavements for pedestrians, hedges and the cross-roads, all suggest that we are still in the stage coach era. The road of the future will be 200 feet wide, without a single level crossing in its entire length. All crossings will be on the "under and over" circular principle, and there will be a minimum speed limit of fifty miles an hour. Any motorist slowing down to twenty will be immediately "run in" by the traffic police for obstruction. Only very high-speed lorries will be allowed on these roads, for which a special toll may be imposed. Starting from one of the entry points, a motorist will know that he has only to keep his speedometer needle pointing at 100 to be perfectly safe. It is unlikely that he will pass any other motorist, and the special surface and absence of bends will eliminate the danger of skidding upon roads which may even be covered in or artificially lit by unceasing "daylight."

The majority of tracks, and even modern arterial roads, have as many twists and turns as a boa constrictor swallowing its prey. If you seek the reason, you will find that some centuries back, when various people commandeered all the land they could lay

hands on, they gave no thought to roads. So we have to turn right to pass along Farmer Giles' field, turn left because Farmer Brown owns that piece of land, bend to the right again because some enterprising landowner has been quarrying gravel, and so on for hundreds of miles. We need another Napoleon ruthlessly to cut roads which obey the Euclidean maxim that the shortest distance between two points is a straight line.

Horses will, of course, have long since disappeared from the traffic area, and the streets of big cities will no longer be blocked for hundreds of yards while a cart horse strains at its huge load. The banning of horses from the roads will also eliminate a good deal of dust and dirt. Men of the future will find it amazing that we allowed domestic animals to foul our streets, while similar behaviour on the part of a human being would have resulted in immediate arrest. They will probably take it that we never forgave our ancestors for turning the pig out of the family drawing room and felt that we owed the dog and the horse this compensation !

Moving and covered pavements will, of course, be raised above the level of the street. It is yet another tradition that pavements must be level with the road. Sidewalks will be warmed and illuminated, while the motorist will need to take no more notice of pedestrians in large towns than he would upon any main road. He will expect a degree of luxury incredible to an emperor of to-day and will regard independently-sprung wheels, cushion tyres and silent roads as obvious necessities of life.

All control will be automatic. Cross-roads, even in cities, will be reduced to a minimum by the use of subways and bridges. Where they do exist, light signals will be worked by the light ray. By arranging sensitive cells on one side of the road and a lamp emitting a suitable ray on the other, it will be possible for a passing car to work its own passage. The car will break the circuit as it passes through the ray, and this will turn the signals on the road crossing to "Danger," preventing any traffic from passing for, say, thirty seconds, when the signals will return to normal. The right of way will be given automatically, as at present, to the road bearing most traffic, and the signals will be switched against cars on this road only when some vehicle wishes to enter from a side road.

Roads themselves will be vastly improved. No intelligent people will allow them to be torn up every six months. The foundations will be sufficiently deep to bear the heaviest traffic almost indefinitely. Probably, the heaviest goods lorries will be banned from the speedways. Surfaces will be designed for long wear and silence. Rubber blocks may be used and so treated as to prevent any skidding. All electric light mains, gas mains, telephone lines and so on will be laid in one vast underground passage, so that, instead of digging up the road every time a pipe is to be examined, engineers will simply descend a ladder and inspect the lines in the tube below.

The lighting of roads will undergo vast changes. Hitherto we have been bound by existing stock, for no one could advance scientific reasons for lamp-posts

and the placing of lights twenty feet above the road. Obviously, it is the road that we wish to illuminate, so that the lights should be nearer to the ground level. Future road-makers will probably use neon-type electric lamps about three feet, or less, from the ground, with a suitable reflector to throw the light rays over the road. This will eliminate the danger to drivers on wet days, when lamps placed high up give treacherous reflections and may even dazzle on the windscreen. With sidewalks raised two or three feet from the road to ensure safety, the illuminating source could be placed under the edge of the pavement and be glass enclosed. Main arterial speedways will be illuminated throughout their entire length, and any motorist using powerful headlights will probably be severely punished. With very few turnings, the up and down tracks will be separated by a barrier, and the danger of accidents very greatly reduced.

It is not impossible that road surfaces will be lit in an age when fog will be far too expensive to be allowed, or they will be coloured to indicate the route. Certainly, the motorist of the future, when travelling at 100 m.p.h., will have no time to examine signposts, and such signs as there may be will be painted in six-foot letters or signalled by radio to the dashboard. Our present system was designed for the leisurely horse-and-cart days and is useless to high-speed motorists. Present-day signposts are often one-sided, as many a driver who has had to get out of his car at midnight and strike matches while his companion climbs the signpost, knows too

well. Route colouring, if not too dangerous, would be a simple form of indication and might also serve its purpose in connection with the airways. A red road, for example, might mark the route from London to Edinburgh. As long as a driver is on a red road he knows he will reach Edinburgh. Holiday resorts may vie with each other in trying to secure the option on the more brilliant colours. "Follow the purple road for Skegness" is an excellent slogan. No doubt, the towns concerned will engage expert psychologists to determine which colour is most likely to hypnotize the motorist.

Two problems of the near future will be noise and gas exhausts. When it is fully realized what waste is represented by noise, motor engines which sound like machine guns and ancient lorries which resemble an earthquake in the effects room of a broadcasting station, will be severely restricted. The owners will probably be prosecuted for larceny; for they steal energy as an ordinary housebreaker steals silver. The elimination of noise is entirely a matter of cash. Anyone who is prepared to spend sufficient money can have silence. Better multi-cylinder cars will, of course, eliminate some of the noise. Silencers will be far more effective. Trams will long ago have been consigned to the scrap heap. Roads will be built to deaden noise, rather than to amplify and reflect its misery. All buildings will be sound proofed; indeed, a house which admits noise will be considered as being on a par with a house that admits rain.

Research will be undertaken to discover the most harmful types of vibrations, and silencers will be so

designed that what small noise is unavoidable will be of such quality that it does not have a too deleterious effect on the human body or is not carried long distances by "heterodyning." It will be impossible to make horns silent or pleasant, for their object is to give warning. A pleasant sound might have the effect of soothing the man you wish to avoid, and, logically, the more distressing the noise emitted by a hooter, the more efficient it is. But perhaps signal horns will be designed so that the sound can be controlled and emitted in a beam, or only audible to the obstructor. Thus, the car in front will hear it perfectly, but anyone standing beside the road will hear nothing. If cats and dogs are still permitted, a horn could easily be designed of such a pitch that these animals would hear it, although quite inaudible to human beings. Inter-car warning lights have yet to be investigated.

The rapid progress of motoring will naturally imply the gradual abandonment of the present type of railway, although it is probably safe to assume that they have at least another hundred years of life. The railway companies may open the lines to motorists, who by a simple adaptation of the wheels could drive along the lines in safety and comfort. Higher speeds could be achieved with less power, and by closing the majority of branch lines, or sidings, it would be possible to reduce signalling to a minimum. A motorist would drive into the terminus on to a platform, where flanged wheels would be fixed in a few minutes. He would then travel to his destination on the permanent way at an average speed of

80 m.p.h., remove the flanged wheels and proceed on the road to his house. Automatic steering on long uninteresting main roads through the medium of underground electric robots is far from inconceivable.

When railway traffic has become so attenuated that it is impossible to maintain services, the permanent way may form the basis of the arterial speedways. It has the advantage of comparative straightness and a minimum of inclines. There would be no cross-roads and little danger to, or from, pedestrians. The only alternative seems the gradual abandonment of the rail tracks, which would rapidly become overgrown. Our children's children may go to see an ancient and rusty engine pulling derelict trucks over a weedy line, just as we now visit a museum to see the transport of past ages. Two or three hundred years hence is not long, but those times will probably see the introduction of railway tourists of a different type. They will be amused, as are we by Roman Walls or the Pilgrim's Way.

The problem of dealing with poisonous exhaust fumes from motor cars may become acute as the number of automobiles increases. The majority of roads are so narrow in cities and the buildings so high, that the gases are retained in still weather and may prove dangerous to passers-by. The cure for this trouble will probably be found in the more complete combustion of the mixture used in the engine cylinders, but, until this is achieved, motorists might be required to consume their own exhaust fumes just as factories are required to consume their own black smoke. Eventually, the coming of the

electric motor car will, of course, eliminate the problem altogether, but it is probable that before that time there will be many "scares"—pedestrians falling unconscious at the road side on warm days—and panic legislation by an ignorant government. It may even be that a motorist will one day stand in the dock accused of murder, because he knowingly drove an imperfect engine which emitted large quantities of lethal gas!

I visualize the day when capacity electrical storage will solve many problems of portable power with batteries changed or even charged in a few moments. Polarized light may pierce infrequent fog in the few streets uncovered or unwarmed, while petrol-electric-steam turbines will pave the way to an era of "broadcast" power, when underground cables will induce energy in motors licensed by the International or Interplanetary Transport Company.

The public will still complain that it is a shameful thing to tax non-stop day trips round the world, and I think that the only step to alleviate the dangers of aeroplanes of which the electrical suspension has failed, will be a use of radio and television to an extent which could abolish altogether all other than telepathic travel.

CHAPTER VII

Radio and Television

THE people of the future will not regard wireless and broadcasting as identical. They will realize that broadcasting is the smallest part of wireless, and indeed, the broadcasting of mere entertainment will probably be forbidden, in order that the æther may not become congested, even with vastly improved directional selectivity. Music, talks, sermons and plays, could be distributed to every house more efficiently by landlines. Entertainments now sent through the æther could be transmitted over the electric light mains, the gas grid, or by special wires. Houses will have "broadcasting" of this type laid on, just as they have drains and electric light "on tap" to-day. Television will be installed in the same way, and every room in the house will be fitted out with speaker and screen.

"Newstellers" will probably be built at every street corner, so that passers-by, who are not equipped with pocket or car radio, will be able to learn the latest stock prices, the position of an Atlantic skimmer, or the progress of a rocket on its way to the moon, without having to read their papers. Travel will lose its terror when one is never out of touch with home. All advertising posters will probably be "talkie" and

moving. A large undertaking will be able to televise a small play advertising their products to a thousand screens simultaneously, and there is no doubt that their animated posters will draw, at the expense of rivals who remain faithful to print alone.

The time when æther-broadcasting for entertainment will be severely limited is probably not far ahead. Already there is serious interference, and although sets may be made more selective, so that they can separate stations using wavelengths only a fraction of a metre apart, saturation point must eventually be reached unless there is a complete change in radio technique. There is a further important point that any unscrupulous man or country could destroy all communication through the æther by building a sufficiently powerful set and broadcasting on all wavelengths. This problem has already arisen in connection with Russian broadcasts. If a people have a new creed and are sufficiently convinced that it points the way to salvation, it is only logical that they should use all available means for propaganda. This method would be invaluable for the spreading of terrorising rumours in war time. It is barely a decade since the greatest difficulty was found in scraping together a few hundred pounds to open the first broadcasting station in Britain, and about thirty-five years since a great expert stated that radio could never have any commercial value!

New wavelengths will be required for many other uses of wireless. Long-distance communication will need more and more. Great progress has already been made in this direction and it is possible for me,

sitting here at my desk, to ring up 75 per cent. of the telephone subscribers of the whole world. Pocket radio and wireless watches will be commonplace. In the future, it will be possible to ring up anyone anywhere, and not only to speak to him, but also to see him on the television screen. An automatic recording machine will take his messages in your absence and have them ready for you to read upon your return.

The problem of television is by no means solved. Present-day apparatus is crude and the results often distorted. It would not be an exaggeration to say that modern television has little practical value. But I believe that progress may be sudden and rapid. Wireless was born, so to speak, in a night, with the invention of the thermionic valve. The aeroplane was made valuable by the invention of the internal combustion engine. Some radio, rather than mechanical, invention may in a day turn television from an experimenter's toy into an apparatus which every householder will wish to instal. The effect on the minds of men and women in the future will be tremendous. They will be able to "look in" at events all over the world. A bazaar scene in India, a baseball match in America, a close-up of an Eskimo's wives eating blubber—a thousand sights about which they had only read will be brought to life with new understanding and toleration. Television and the aeroplane between them should even make war less frequent, unless it produces a scramble for wavelengths or for landing grounds on other planets. Morals and modern law will be shaken to the core by visual propinquity.

Wavelengths will be required for the transmission of light and power in the dim future. At present, this achievement is in the embryonic stage. I have lit a lamp inductively by power transmitted over a distance of a few feet. But this is a vastly different problem from broadcasting power from a central station to a thousand houses. Possibly we shall find a new type of vibration, in conjunction with the shortest wireless waves, which might form a better medium for carrying power. In any case, it seems certain that some time during the next few hundred years, the secret of transmitting power by æther oscillation will be discovered. Certainly it will revolutionize our transport and our homes.

Many people are under the impression that because a lamp has been lit in Sydney by wireless from London and target battleships have been controlled by wireless from the parent ship, the secret of power transmission is already known. There is no connection at all between control by wireless and power by wireless. The difference between moving a delicate switch a hundredth of an inch and turning the screw of a mammoth liner, is very great indeed. The power received by the average wireless receiver is not nearly sufficient to move a small feather one thousandth of an inch. A broadcasting station may use some hundreds of horse-power, but all that the aerial in your home collects is not sufficient to light the smallest lamp; all the rest is dissipated. The problem to be solved is that of controlling and receiving all the horse-power used at the transmitter. There will inevitably be leakage—just as a certain

amount of power is lost in the transmission of electricity by copper cables—but if one thousand horse-power are used, at least nine hundred should be picked up at the other end.

It is possible for any boy of a technical turn of mind to demonstrate control by wireless, and I think that this type of control will be used far more in the future. In practice, a small switch has to be moved a fraction of an inch by a similar apparatus to that used to operate a loud-speaker. This brings into action an electric motor, which in turn provides the power for performing whatever task is required and is fed from some local battery or main.

The high-speed goods aeroplanes of the future will probably be guided by wireless. No pilots will be necessary and problems of heating and breathing in the stratosphere will automatically be eliminated. The controls of the aeroplane will be connected with a wireless receiving apparatus tuned in to the wavelength assigned to this route. On the ground the pilot will transmit a series of coded wave trains which either affect an apparatus like a letter lock through a tuned receiver, or which take the signals by a tuned pendulum. By these means or by a time lock, it is possible to prevent a great deal of outside interference with the sending plant. The receiver will move the throttle forward, make the necessary movements of rudder and elevators and the aeroplane will leave the ground. Once in the air it will be kept level by a gyroscope and on its path by a continuous stream of dots and dashes. Any tendency to stray would be automatically corrected,

the fainter the dots becoming, the more the rudder being applied. The principle will, probably, be much the same as that of the thermostat, which enables a constant temperature to be maintained, any tendency to rise or fall being corrected by the addition of heat or cold as required.

There will come a time when the position of the controlled plane can be determined by signals actually sent out by the travelling machine. It would be comparatively simple in the light of new radio developments, for another pilot at the landing end to get into touch with the receiver on the aeroplane, and bring it gently to earth. Two men could thus guide a tremendous number of goods aeroplanes through the air, reducing the cost and eliminating the danger of human accidents. To prevent misdirection through "jamming" or the reception of other signals, each aeroplane would have a "key" and all orders would be transmitted in mechanical cypher. The receiver would thus take no notice of any other signals not transmitted according to the prearranged plan.

Cargo vessels on the sea will probably be steered in the same way, and inevitably the invention will be adapted for use in warfare. Wireless-controlled torpedoes were demonstrated during the last war and the wireless-controlled tank, with heavy armour plating to protect the receiving apparatus, is an obvious development of the near future. The "guns" of the enemy would become powerful transmitters trying to jam the tanks by a "direct hit," but the cypher system would, to a degree, prevent this.

When light and power are broadcast to all houses and factories by wireless, switches will become a thing of the past. Light-sensitive cells will be installed in every room and as soon as the illumination decreases to a certain point—the exact moment when artificial light becomes necessary will be decided by a committee of expert opticians—the receiver will be put into action and the lamps lighted.

The lamp expert may come half way to meet the wireless engineer in the problem of light transmission by wireless. At present, a vast amount of power is required to produce comparatively little light. More than 95 per cent. of the power used for lighting the average bulb is wasted in the form of heat. If we knew the secret of cold light and the glow-worm, we could almost light a country mansion for a year with a pocket flashlamp battery. Cold light will be one of the great subjects of the future, and the discovery that such lighting could be produced by a very small amount of power would bring the era of wireless lighting very much nearer. Gas tubes of the neon or vapour type are possible forerunners of an improvement in the most important commodity known to civilization. Law and order do not last long in even temporary darkness.

When power can be transmitted efficiently, all forms of transport will be electrically driven by power broadcast from central stations. A small motor will be sufficient to propel any vehicle along the highway and a “dummy” aerial will take the place of the radiator. Refrigerators and electric fires will be supplied with power from the government

station, and even aeroplanes will be driven electrically and landed by the forces of electrical repulsion in small, specially-constructed stations.

The effects of all this transmission will, of course, have to be carefully considered, but as far as we know at present, broadcasting on the commoner wave-lengths has no very noticeable effect on human beings, buildings or plants. The gigantic marrow grown under the wireless aerial will probably be proved to owe its size to a forgotten heap of manure, and the "music" which some people complain they hear whenever they are near a transmitting station will be shown to have its origin in what house surgeons politely term "h-y-s-." But if ultra-short wave-lengths are used for the transmission of power and light, a royal commission may have to decide on dangers which may result.

We know that certain very short waves have the effect of heating the human body over short ranges. Doctors can now use a short-wave transmitting set, instead of the old mosquito bite, for inducing an artificial fever in patients. These waves may be discovered to possess some great value in medicine and even be capable of removing certain growths more effectively than radium or X-rays. If the results are found to be harmful to human beings, every man and woman will either have to be "earthed" or screened. Possibly the introduction of some suitable substance into the clothing or our blood will be sufficient. It already seems probable that the electrical consequences of the brain's working may lead to the conclusion that life affects life without contact.

It is a short step to the day, in this case, when mental protection is required to prevent a mild degree of thought interference under suitable conditions. I do not think the people of the future will allow such dangers to stand in their way. Man will naturally produce some device so that he can enjoy the luxury of radioed power and light, should they be dangerous to him in the ordinary way.

Attempts will undoubtedly be made to broadcast other things besides sound, light and energy. In the first instance, this will be for the purpose of entertainment. A photograph of a rose, for instance, would appeal much more if accompanied by the appropriate scent. Probably scent will prove one of the easiest senses to broadcast. Even now, by talking in the right way, I can suggest a smell so strongly over the telephone that my listener actually perceives. Men suffering from concussion smell odours which actually are not present, suggesting that smell is merely the stimulation of certain brain cells or their mechanical simulation.

After transmitting the sense of smell, engineers will attempt to send feeling by wireless. When a man is describing a fur they will attempt to give the audience the feeling of the skin. The first experiments will, no doubt, be exceedingly crude, and it is possible that the audience will think they are sitting on sharp rocks when actually the feel of a velvety lawn is being broadcast. But the crudeness of our present televised pictures does not prevent us from believing that one day the reproduction will be

almost as striking as the original. Indeed, reality may become hard to define.

It is important to realize that the cinema and wireless are illusions or reproductions, and not reality. The sound that issues from the loudspeaker is not the sound made in the studio. It is a mechanical imitation. The sound waves are represented by wireless waves which at the receiving end are turned once more into proportionate sound. But they are not the same sound waves made by the violin or the larynx. It will be the same with scents. The scent will not be broadcast but the sensation of scent will be transmitted across the æther.

The final triumph of the radio engineer will come in the very far distant future when he learns how to transmit matter. There is no theoretical reason why matter should not be sent across space. The principles involved will be the same as those now used in transmitting sound. Matter will be turned into æther vibrations and at the receiving end turned back once more into matter. It should be possible for me to place the pen I am using in a suitable apparatus, turn a switch and see the pen slowly disappear as it disintegrates into the constituent electrons and neutrons, which would be re-assembled miles away.

Absurd as this suggestion may now seem, it is a logical development of our knowledge of the atom and should not appear more impossible to us than the idea of talking over three thousand miles of space without intervening wires appeared to the nineteenth century men and women. Such an apparatus would call for knowledge which we do not possess, and I

would not like to give a date for the accomplishment of this triumph. But I can foresee the world fêting the pioneer of many centuries hence who is first transmitted by wireless, his whole body reduced to constituent parts and re-assembled a mile away !

Research into wireless waves may reveal the existence of hitherto unsuspected vibrations, which are responsible for many inexplicable events. Why, for instance, do I take a dislike to another man's face, even though I do not know him ? "Instinct," the psychologist may say, or offer some more complicated reason connected with an inhibition or complex I acquired in my extreme youth. But the people of the future will probably discover that the man emits some very delicate vibration which does not "heterodyne" with my own and which causes a disturbance in the brain, entirely by electro-chemical reaction.

Recent investigation has definitely suggested that all living things emit oscillation similar in type to wireless waves, but which directly affect other living things. It is possible with these rays to induce some form of artificial cancer in an onion. It has been found that certain flies are susceptible and cannot live a normal and happy life unless the vibrations of other flies reach them. For many years scientists have been puzzled over the phenomena of some insects and bacteria. The flies would not breed when a single pair was kept under a bell jar. A single bacterium would not divide and increase its kind in the usual way. But introduce a few more flies to the bell jar and the original pair breed freely. Surround the bacterium with others of its kind, and

it will divide in a normal way. The discovery of the, as yet, unnamed rays suggests that they are responsible, and that their absence retards growth and development. This may conceivably explain why the townsman is as healthy as the countryman.

Our children's children will probably be able to produce nitrogenetic rays artificially—it has already been done on a small scale—and use them to assist the child of stunted growth. They may enable farmers to produce sheep the size of elephants and the allotment holder to grow a marrow which really satisfies his dreams.

It is a mistake to think of radio waves as being simply those emitted by the usual transmitting set. There is probably a huge band of vibrations, and on the comparatively shorter wave-lengths it is just possible that a difference of a ten-thousandth of an inch makes a material difference in the quality of the movement. Just as white light has been split up into component parts—although the ancients thought it was indivisible—so may other æther waves be broken up by the scientist of the future. They will probably find that these vibrations given off by living things have the effect of stimulating the emotions, in accordance with their exact wave-length. Some are believed to be capable of penetrating a sheet of lead one inch in thickness, and there is no reason why they should not penetrate the skull and affect the brain. Quartz glass is not penetrated to any extent, so perhaps, if we do not wish to be disturbed, we may wear a glass skull cap.

It may be found that the human body is one

gigantic wireless receiving set, or an electrolytic detector, although it is doubtful whether it will be found to be capable of receiving messages on the present wave-lengths without the intervention of apparatus. Telepathy and similar phenomena may be accidental manifestations of the power of the human brain to transmit and receive messages by æther motion. The people of the future will endeavour to control this faculty and eventually men will communicate with each other without the clumsy intervention of words or the necessity of moving the tongue and blowing air through the throat. The power of speech has made little progress for many centuries and the chatter of apes is too similar to that of idle women to satisfy those who believe that the human race is destined for a greater purpose. A vast amount of time and energy will be saved when telepathy is taught in schools and the atrophy of tongues allowed to accompany that of the teeth.

From the first faint wireless signals doubted and then heard by eager scientists in primitive headphones, to the use of wireless as a means of communication without mechanism seems a long chapter ; it will take thousands of years to complete ; but a thousand years is a flashing second in the history of the human race. The future of wireless lies not in a cheap and effortless means of entertainment, but in the transmission of cheap power or light, with the eventual elimination of all the waste now caused by heating the atmosphere with our lips every time we ask for a glass of water.

CHAPTER VIII

Crooks and Detectives of the Future

CRIMINOLOGISTS of the future will remark on the comparative rapidity with which crime became a scientific occupation; in that its practitioners adapted technical knowledge and invention to their own ends. They will note that during the period immediately following the Great War, crime rapidly changed from the occupation of "Bill Sykes" to an art practised by men of sufficient ability to realize that science offered them many valuable weapons of offence and defence, so that for a time, the criminal definitely held the upper hand. They will, perhaps, find it difficult to believe that men actually drove up to a jeweller's shop in a high-speed motor car, smashed the window in broad daylight, snatched what they could and got away with it; to repeat the whole business next day.

Before the War, the arrest of a handful of assassins in Sidney Street took a large force of police and military many hours, and nearly resulted in the artillery being called out. I think the people of the future will always wonder why the newspapers laughed at Mr. Churchill's idea of bringing out the guns. It will seem to them entirely natural, and they will, perhaps, note that it was the lack of this logical

ruthlessness in pursuing the criminal—who was himself ruthless because insane—which enabled criminals to become so powerful. After the War, burglars in cars capable of seventy miles an hour were pursued by constables on pedal bicycles; safe-breakers with the finest tools that science could give them, were chased by policemen with whistles and truncheons, and homicidal lunatics armed with revolvers, tackled by detectives with nothing but their hands. Although the criminal is inevitably of a defective mental type, he has grasped more quickly the value of scientific inventions, than the detective who is hidebound by tradition and red tape.

The criminal of the future will still further utilize up-to-date methods. His cars will be specially built for him. He will probably be using the aeroplane for daring raids long before an aerial police force is inaugurated. Just when the police think they have the measure of car bandits, with fast cars, barriers and wireless, the law-breaker will take to the air, and dropping on to the roof of the house which he intends to burgle, will laugh at any police on the ground. He will develop new and more profitable crimes; or take up psychology and hypnosis with a view to making the confidence trick easier. He will use photographic methods for forgery and coining; X-rays for examining the contents of safes before troubling to open them, and new rays in place of his old oxy-acetylene blowpipe.

Are the police still going to compete with truncheon and whistle alone? I can hardly believe that future householders will be as stupid as those of to-day.

Streets in which shops with valuables are situated will probably have at either end barriers which can be closed by the insertion of a key in a fire-alarm, thus instantly imprisoning every vehicle ; constables on country roads will be armed with collapsible spiked mats made of aluminium. These they will be able to throw in the path of any oncoming car which refuses to obey their signal to stop, and they will follow up their attack with gas pistols which eject an anæsthetising vapour, or shoot a bullet filled with some suitable narcotic drug having instant effect.

Banks, safes and other valuables will be protected by an invisible ray which will instantly ring an alarm in the police station and perhaps televise a picture of the interior of the building by means of infra-red rays which work as effectively in the "dark" as in the "light." Policemen on their beat may be armed with some device for enabling them to examine the interior of buildings without having to enter, and undoubtedly they will all carry small cameras, which will provide invaluable evidence.

Before even such mild reforms as these take place, a complete change in mentality of all concerned with detection must occur. It is only necessary to sit in a police court for a day to see that the watchman's rattle is still in the minds of those who govern everything. A policeman states in the witness box that a motor cyclist was making, in the words of the law, a "loud and objectionable noise," and the motorist is fined ten or fifteen shillings. Apart from the waste of time, what evidence is offered that the noise was really made ? Did the policeman measure it with

his handcuffs ? Obviously a judge in the future will demand scientific evidence. He will require photographs of the noise brought into court, and from the wave lines which represent the noise turned into light, he will be able to judge whether it was excessive, or objectionable. For the good reason that a policeman's sensitiveness to sound often varies with the amount of food in his stomach, it is certain that many motorists have been fined because they happened to pass a constable who was looking forward to a good dinner. It is the fault of the law, not its most important and vital representative.

In the future, of course, all such mechanical work as traffic control will be performed automatically. Where conditions are variable—as at a big race meeting—the traffic will be directed by one man sitting before a switchboard in his aeroplane two or three hundred feet above the road. By simply touching various buttons he will be able to release wireless-controlled signals on the ground. Until recently it seemed to be considered that the same mentality was required for pursuing cunning criminals with all the inventions of the century at their disposal, as for holding the arms akimbo at cross roads. This was the only explanation of the only system of promotion from uniformed constable to detective.

Detectives are now being recruited from a different class. It is not suggested that the men who have hitherto worked at Scotland Yard have been inefficient, indeed, I think the people of the future will marvel at how much they accomplished with the education and facilities at their disposal, but, obvi-

ously, crime is a special study, and if it is necessary for an engineer to have a degree before designing a bridge, it is probably also important for a detective to undergo a long period of technical training before undertaking to catch clever criminals. Many of the subjects he will be taught may not seem of direct use, but a scientific detective will have to know a good deal about abnormal psychology, something of anatomy, ballistics, and chemistry, to mention only a few sciences. The present-day detective has had to "pick up" something of these sciences in the course of his twenty-five years in the force, but just as the knowledge is becoming of definite use to him he reaches the retiring age and makes way for another man, who also has had to glean the all-important and very necessary knowledge. I shall expect to see a Chair of Criminology established at the Universities during the next few years, so that research into the causes and effects of crime and punishment as well as detection can be scientifically studied. Until recently the present system has been too haphazard to satisfy any scientific age. The observation of occupational dust, cigarette ash and the use of a spectroscope should not be left to outside assistants who, as in the case of warfare, are indirectly responsible for the success or failure of the whole system.

Detectives frequently complain that they can catch criminals, but are unable to *prove* their guilt. The public will not always be content to let murderers remain at large until such time as they commit another crime under the noses of obliging witnesses, and they will call for combined psychological and

physiological tests to discover the guilt or innocence of suspects. These tests will be entirely scientific, and there will be no question of "framing" the evidence. They were used many years ago by primitive peoples who did not understand them, and who surrounded every trial with mysteries from religion and superstition. They are all based on physical manifestations of thought.

For example, intense mental reaction results in perspiration. The amount of moisture is so small that it might not be seen even with a powerful magnifying glass, but it can be measured electrically with the aid of a galvanometer. When a detective is questioning a suspect in the future, he will be provided with an apparatus which makes electrical contacts on the skin of the examinee. In response to thought, the needle will swing, steadily if the questions asked do not arouse abnormal reactions, violently, if they set up intense mental agitation. Skilfully worded questions would soon prove how much or how little the suspect knew of a particular crime. The rate of breathing and even that of the heart beats could be measured in the same way, while statistics could, no doubt, be prepared to give "average reactions." Trial by ordeal will be made scientific, just as alchemy and herbalism have been metricised.

The study of criminology as a science will be divided into three sections. Firstly, the prevention of crime and criminals. Crime is not a natural thing. Even among animals, criminals are the exception. Many of the causes of crime have been analysed already and others will certainly be discovered. It

will probably be found that a criminal tendency is always accompanied by physical abnormality of some kind. Examination of infants for specific variations which can be cured by surgery or medicine will result in a large number of latent criminals growing up to be respectable citizens. We know now that the majority of criminals have some facial feature exaggerated, but we are uncertain of the reason for this fact. The knowledge that many criminals have receding foreheads or standing-out ears may help in their detection, but the reason for these abnormalities would definitely assist in elimination.

A great deal of crime will disappear when economic conditions become better. Poverty is probably, with love, the most frequent cause of crime. It is an even stronger motive than affection, for criminals will steal from those for whom they care to buy bread for themselves. Sex, hunger and fear are major emotions which breed a considerable amount of sympathy with wrongdoers under the present rather vicious systems of useless punishment.

Slums give us criminals, and the elimination of bad housing conditions will result in a reduction of the number of the lower types. But the modern criminal, with his up-to-date equipment, motor car, and scientific knowledge, though discontented is not uneducated. Often he lives in luxury, none of his friends suspecting that his wealth is tainted. Here, neither poverty nor bad housing will be found to be the cause, which is more possibly a type of insanity as yet unidentified or some obscure glandular abnormality.

The second section will be the detection and capture of criminals. The highly-educated detective of the future will be paid an adequate salary. He will no longer be treated as a clerk, when his brain calibre is that of a Prime Minister. He will be encouraged to experiment, for it is the unexpected that always catches the criminal. Housebreakers, for instance, do not worry in the least about policemen on their beat, because they know to a minute at what time the policeman will be passing a given house. So it will be with every detective device in days when watchers talk to the man on the spot by radio. As soon as the criminal finds spiked mats being used, he will no doubt use a car with solid tyres, and it is the detective who replaces the mat with a powerful sticky substance who will catch the crook unawares. In the past, the tendency has always been for the paid authorities to be one step behind the criminal. In the future, he will aim to be one step ahead and will be taught that imagination is not always a crime.

Eventually, I anticipate that many criminals will be caught by automatic devices which will hold them until the arrival of the human detective. A wireless-controlled robot, for instance, could disperse a crowd without danger to the police. Equipped with loudspeaker, tear gas bombs, searchlights and possibly steel grabs, the robot would be controlled from a small police car a few hundred yards behind it. Advancing up the street towards the rioters, the loudspeaker would announce that if the crowd did not disperse immediately, tear gas would be

discharged and a certain number taken into custody. It would be useless for the crowd to fire at the robot, for it would be heavily protected by armour. The grabs would go out, seize a certain number of people, who would struggle in vain, and if the crowd still refused to move, the gas would be discharged, incapacitating for a short period everyone within range. In response to wireless signals, the robot would take its prisoners to the police station, where a cinematograph film taken from inside the robot would immediately prove the part the prisoners had played.

Thus a task which now results in the loss of many lives would be performed without danger to the police, and possibly by a single man, where before, a hundred would have been required. From the point of view of the rioters, the grabs and the tear gas would prove a great deal more humane than clubs and bayonets. In the future, it will be realised that chemical weapons are infinitely more humane for dealing with offenders than direct violence, which may crack a skull. Tear gas incapacitates for a period up to twenty-four hours, without dangerous after-effects.

The same type of apparatus would be used for guarding valuables. I believe that, at present, quite a number of soldiers are constantly on guard during the night at the Bank of England. Half-a-dozen concealed robot detectives would serve equally well and release the soldiers for more profitable work. The robots could be made to respond to impulses from light or sound, and as an intruder would find it difficult to move without a flashlight or making a noise, he would

immediately start the apparatus. Flashing a wireless signal to the nearest police station, the robot would advance towards the intruder, hold him in iron arms, regardless of shots or blows, and keep him until the arrival of a human policeman.

Really scientific murders have hitherto never been committed. It is fortunate that murder is not a crime used by the intellectual criminal or a hobby of scientists, for any man with sufficient medical or scientific knowledge could commit a murder that was well-nigh undetectable. In the future, we may find murders committed by delayed action poisons of a new type, so that the actual murderer is on the other side of the world when his victim dies ; we may have bacteriological murders, electric ray death, and even murder by suggestion. Detectives who have really expert knowledge will be required to deal with such crimes. It is not hard to imagine some murders of this type which would be, in actual fact, undetectable and even if suspected, where the guilt could not be brought home to the criminal. It is fortunate that the men in possession of the necessary knowledge for the manufacture and use of the drugs or bacteria are inevitably moral and that the whole teaching of science is directed against crime. If the lessons of science were as vague as those of dogmatic religion, a wholesale slaughter of the relatives of scientists might take place.

Perhaps the most important section of criminology will be that devoted to the punishment and cure of criminals. Criminals have, since the world began, been punished in every conceivable way, from solitary confinement to [#]decapitation. One day in the

future, the people will wake up to the fact that punishment is not progress. They will find the same men going to prison over and over again, until eventually, perhaps, they are hanged for murder. People will find no appreciable lessening in the number of criminals and will come to the conclusion that imprisonment is neither a punishment nor a cure.

It is difficult to imagine the mentality of the man who first conceived of the idea of imprisoning those who broke the laws of society. The idea was, I suppose, partly revenge by society and partly to get the man out of the way. But, undoubtedly, men are imprisoned for the same reason as they are hanged, because we do not know what else to do with them. The new spirit that is creeping into law can be seen occasionally when a shoplifter is put on probation for so many months conditionally upon entering a nursing home. But there is no reason to suppose that so-called shoplifting is the only crime committed through abnormality. Perhaps it was once considered that law was force, and relativity in embryo made it clear that for a prisoner to throw himself against his cage is the same as if the bars were used to beat the same prisoner.

The criminologists of the future will argue along these lines. This man has murdered his mother. It is unnatural to murder your mother. Therefore, there is something wrong with his mind. He is insane, if not in the legal sense, then in the true sense that his brain does not work according to the laws of average. This insanity may be caused by a definite disease or some inherited abnormality. And

they will proceed to put the criminal under observation in order that he may be treated and cured. They will have the sense to realize that a murderer turned into a law-abiding citizen is more valuable to the State than a corpse with a dislocated neck.

Certain diseases will probably be found to produce criminal tendencies. Sleepy-sickness is already suspected of being one. Many a man has done things when afflicted with a common cold or an attack of indigestion which he would not do if he were normal. Abnormal glands make the giant on the one hand and the midget on the other. They may have the same effect on the mind and produce alternatively the saint or the vilest criminal. Surgical operation or injections will probably turn this type of person into a normal being, just as it turns the puny child into a healthy man. Prisons will disappear in favour of hospitals. Our children's children will probably carry out Samuel Butler's suggestion literally, and put men who are ill in prison and those who have committed crimes in hospitals. Certainly, solitary confinement is more beneficial to the man with a cold than to the individual with a false sense of morality.

It may be found that treatment by rays or even special diets will be successful. No one has yet troubled to produce a statistical analysis of the type of food eaten by habitual criminals. Although it may sound ludicrous to-day, the experts of the future may prove that fish and chips produce a tendency towards pickpocketing. Undoubtedly, a Royal Commission will be instituted to inquire into the incidence of the habitual criminal amongst vegetarians. It

may even be discovered that prison diet encourages criminal tendencies and that this is the reason why so many men return.

The criminal will, of course, eventually be entirely eliminated by education. Children brought up in a scientific fashion will realize that crime is unscientific and non-technical. They will realize that the saying "Crime never pays" does not mean that it is more profitable to be a company promoter than a pickpocket or an auditor than a safe-breaker, but simply that crime is purely destructive. It frequently "pays" the offender, in the narrowest sense, but never pays the human race. And children of the future will, quite naturally, be governed in their actions by the probable effect on future generations rather than by immediate results. They will be masters of their emotions and not their servants. The sight of a diamond bracelet in a jeweller's window will not excite them, because they will know that diamonds are only carbon in a slightly different form, and if they have acquisitive instincts, they will probably satisfy them by buying a pennyworth of lampblack and realising that it represents a diamond necklace and is chemically identical. The mere flashing of baubles in the sunlight will not interest them in the least, even though marriage has been maintained.

CHAPTER IX

The Future Law

MAN-MADE law, as distinct from natural or technical law, there has always been, and always will be, until the science of commonsense brings about the long overdue combination of the two principles. Contrary to the popular idea, the scientist does not make natural regulations, he only discovers and codifies them. But the State makes laws. It says: "It is perfectly natural for a starving man to snatch away something from the rich man's table, but we will make it illegal and punish the offender." It is impossible to break a natural law and any attempts at doing so invariably carries its own more than sufficient punishment.

All law has changed throughout the centuries and it will continue to alter even more rapidly as the influence of science is felt. The people of the future will probably regard the law which imposes heavy punishment for an attempt to commit suicide in the same way as we look upon the old law which hanged a man for stealing goods worth ten shillings. They will be amazed to find that the law held a man responsible for his wife's actions, that he could be made to pay for the slander which she published over the garden wall or the scurrilous notes she sent

to someone she disliked. They will be equally horrified to find that he might be called upon to pay her debts or supertax, with prison as an alternative.

Great changes will take place in the law relating to man and woman, husband and wife. It is not long since a wife could own nothing, when even the clothes in which she stood belonged to her husband. If a pickpocket snatched away her watch, he was charged with "stealing from Mrs. Smith a gold brooch-timepiece, the property of Mr. Smith." When she saw the charge, Mrs. Smith might well wonder if she was not, in fact, the thief herself! In modern times, an attempt to rectify this confusion has resulted in circumstances almost as foolish, in the opposite direction.

In the future, lawyers will be amazed to find that at a time when women talked of equality they were willing that their husbands should pay their rates, and if they deserted them, pay maintenance or go to prison. They will be appalled to read that two-thirds of the debtors in prisons were men who could not, or would not, maintain their wives who were living apart in some different quarter of the globe under circumstances of intense interest to the local watch committee.

They will find it difficult to believe that women who offered their bodies to men for money were harried by the law and fined or imprisoned, while the men who accepted the offers went unpunished; considered it, in fact, "quite the thing."

A land must be strange where a contract of marriage is different from every other kind of agreement and

allows a woman to live in luxury at another person's expense with no other liability than that of occasional co-habitation. For many years the bio-chemical and numerical differences between the sexes rightly apportioned the blame for unfaithfulness. To-day, a degree of mental equality exists which cannot possibly be justified by fact or by the responsibility of women to the duties of the community.

When, one hundred years hence, our children's children look at illustrated books and see pictures of an early twentieth century court, they will probably point to the wigs of the barristers and ask : " Why did they wear those funny things ? " Parents will explain, if possible, that some hundreds of years before, men had lived in such filthy surroundings that even the best were attacked by sores and other complaints, and to cover those on their heads, horse hair was permanently waved and placed on top. When men became cleaner, the need for wigs disappeared, but lawyers continued to wear them, as it impressed the prisoners or witnesses and added " dignity " to the court. Of course, without the horsehair, the parents will explain, the court would seem a little ridiculous.

The law court of the future will resemble a lecture room rather than a museum of antiques. There is no more reason for wearing false hair and ermine for judging whether a man has or has not done certain things than there is for determining whether some chemical is soluble or insoluble in water. A chemist wears clothes designed to help him in his work when he enters a laboratory. He has discarded the

magician's gown in favour of a hygienic white coat. For judges and barristers to think clearly when wrapped in cloth and crowned with horsehair must require prodigious effort.

"Advocacy," which seems to mean the conviction or acquittal of a prisoner by the power of oratory, will disappear. Our children's children will think it terrible that an innocent man should be legally murdered because the Crown happens to have a representative in the court with the power of persuading twelve men that certain things happened in a particular manner, or alternatively that counsel for the defence should be able to secure an acquittal solely on the strength of his ability to sway the emotions of a jury. It is useless to pretend that this may not be so. The barristers who receive the highest fees are not necessarily the most learned. The innocence of certain men who have been convicted has subsequently been established. An Appeal Court is permanent evidence of the fallibility of judge and jury.

Evidence will be tested scientifically. Instead of asking questions to trap witnesses, counsel will simply apply the lie detector, so that witnesses stand self-convicted if they utter untruths. They may even be required to take a small dose of a certain drug which makes untruthful answers to questions positively difficult.

There will probably be only one counsel engaged in a case, if, indeed, there are any lawyers at all. The judge will, perhaps, conduct the arbitration for both sides, and act as jury as well. In difficult cases,

it is admitted, even to-day, that a jury is often incompetent, and a judge sits alone. Even in cases where a jury is empanelled, it is possible to appeal on the grounds that the verdict goes against the weight of the evidence—in other words that they were inefficient. The law at present is tremendously complicated, and only the great patience and ability of our judges makes it possible to obtain decisions from juries at all. In the majority of instances, the jury simply carry out the judge's guarded instructions. In many other countries, verdicts are so grossly influenced by political or religious considerations that they are frequently farcical.

The people of the future may find that law by popular representation, like government, is a wasteful and unscientific method. Juries may become professional bodies, of the same standing as judges, and composed of selected men, whose integrity and ability to balance evidence is undoubted. This will release from bondage a vast number of men and women who at present may be snatched at any time from their homes or work without compensation. They may even be locked up for a week or longer. The vast majority of cases will be tried by a judge alone and the appeal, if any, will go to a jury. This seems a more logical method than obtaining a verdict from a jury and then appealing to a court of judges. Such absurdities as arguing whether there ever was a case to go to the jury—after a week has been spent in putting the case for both sides—or as to whether the jury were misdirected will disappear. Neither will it be permissible for the accused to plead, “not

guilty or if guilty I was justified and if justified I was not present." The facts are scarcely less quaint.

During the next century, there will probably be a complete revolution in law. Some man will come to light with the courage to denounce the whole system as bristling with absurdity. It is terrible to think that a house cannot be sold without so much per cent. being paid to solicitors, that a man cannot usually obtain a divorce without paying several hundred pounds, that an innocent man charged with murder may be hanged because he has not the money to brief the best counsel. It is wrong to say there is one law for the rich and one for the poor. In most circumstances there is no law at all for the poor. True, free legal aid is offered to prisoners, but do we ever find the best-known counsel taking a court brief? We cannot blame the barristers, it is the system which is at fault.

The law must be codified, so that for most cases a man will be able to plead his own cause without the intervention of counsel, or solicitors. The system of precedents will disappear. At present, it is possible to plead that such and such a judge, giving a decision in 1834, laid it down that a certain thing was the case, and the judge must give his decision according to this statement. The people of to-day are shackled by the decisions of judges who have long since become dust and who, in any case, may have been wrong or suffering from an attack of gout at the time. It is just as if the scientist said: "The present interpretation of the atomic theory is wrong, because in 1775, so-and-so, who was president of the

Royal Society, said atoms could not be divided." The law has only changed when change has been thrust upon it. The laws of motoring are based on stage coach ideals, the law of marriage is understood by no one, and there is no law at all against certain new types of crime brought into being by the wrongful use of scientific knowledge.

Spitting in public was not considered criminal in the days before the invention of the germ theory. Now it is limited by law, and spitting in certain places will cost you thirty shillings the first time and fifty the second ; although you may still spit in the streets. You can sneeze in a crowded bus with impunity ; and although the damage you do to your neighbours by spreading disease may amount to a hundred pounds, you will go scot-free, while the man who removes ten shillings from your wallet gets two months' hard labour. If you libel or slander your neighbour, you may find yourself in prison, but you may suggest him into a nervous breakdown or keep him awake half the night by making a noise, without serious risk of running foul of the law. Steps will certainly be essential to prevent the wholesale exchange of such commodities as glands, scalps and legs by futuristic methods of graft and grafting.

In the future the man who sneezes in public will be put in a prison cell until his cold has gone. The woman who gives her neighbours indigestion by talking in a loud voice in public will be put on bread and water or a diet calculated to reduce loquacity. New laws which I have discussed at greater length in the chapter on religion will be made

to govern such things as the transference of glands and human spare parts, the creation of life and control of the weather.

Our children's children will never be content to waste such a vast amount of time arguing over what has happened. Probably magnetic records will be made on steel strips of any conversation likely to be important, so that it can be placed on evidence. They will be appalled at the idea of thousands of men giving up their whole lives to arguing about the law. Arbitration will almost completely supplant law for civil cases. Men will slowly learn that crime is foolish and barristers will become as extinct as magicians and court jesters. The post of Attorney General will probably be maintained by the monarch with a sense of humour, as a sinecure and given to the Poet Laureate for inspiration in lieu of the barrel of wine to which he is now entitled. The Scots term "writer" shows clearly the origin of a lawyer's very serviceable position.

The history of science has certain definitely marked epochs—the discoveries of Galileo, Harvey, Dalton, Lister and Pasteur each marked a new beginning. For most purposes, sociological snobbery excepted, all the books previously written could have been burned. Perhaps, when a similar time arrives in the history of the Law, the people of the future will make a bonfire of the dusty tomes in which precedents are recorded and realize that there is only one law, which has been repeated by all the greatest philosophers. In Europe it is generally expressed in terms of loving your neighbour as yourself.

CHAPTER X

The Next Wars

THE war to "end" wars has been fought so many times that sober-minded optimistic people find it difficult to believe that there will be any other great war. But from the scientific viewpoint, however much one may wish for peace, it would be foolish to assume that, while the causes remain, war itself can have disappeared never to return. So long as we have policemen patrolling the streets, bloodsports, fathers flogging their children and pugilists knocking each other about, there will be war. We still appeal to brute force in preference to reason. The law allows a verdict of justifiable homicide. In the eyes of the military, war is merely desirable and justifiable homicide on an international scale.

It is generally assumed that the war of the future will be far more terrible than anything that has been known before. With this view I cannot agree. It will be terrible, but war has always been terrible, and I refuse to regard death from gas poisoning or lethal germs as more disgusting than death from disembowelling with a bayonet, being impaled by a spear, or cut to pieces with a sword. The next war will, if anything, be more humane, for it may be over so quickly that the suffering will be short, or it may

last so long that we regard it as a normal circumstance. Strategists will realize, after centuries of experience, that killing a few men in the front line does not count at all, and that one good thrust at the enemy's munitions, gas factories and alleged civilians, is more effective than a twenty-four hours' bombardment at the front line. I doubt if armies and navies will have time even to mobilize in any future war. Britain entered the war on the 4th of August, 1914, and her armies were ready for fighting ten days later. In the next war no enemy will be polite enough to allow ten days for preparations. The first blow will be struck at the same time as the declaration of war, perhaps no declaration will be made, so that surprise will be logically complete. The centres of industry and military activity will be paralyzed in a night by being soaked with gas and bacteria from the air, the larger part of the population will be temporarily put out of action by lachrymose or anæsthetic gases, and war will be over before many had realized that it had begun. More like a South American election.

The whole distinction between soldier and civilian is based on sentiment. There may have been a genuine difference three hundred years ago. There was practically none in the Great War and there will be none at all in the next. Any nation sufficiently barbaric and ruthless to resort to arms will not be governed by sentiment and all the treaties on earth will not protect the so-called non-combatant.

Military leaders will argue that armies cannot fight without food, weapons and ammunition. These

requisites are supplied by civilians. If we prevent civilians from manufacturing arms, supplying food and contributing money, we shall stop the war, but if we attack the army, we merely kill men who can be replaced by others ; men who have been paid by others to do their dirty work ; men who do not, in fact, necessarily represent the flower of the nation from the technical aspect of progress or civilization. Therefore, an air raid on the enemy's real bases, his industrial towns, is the obvious step. Men will laugh at the idea of women being " non-combatants " when it is learnt that these gentle creatures are employed in munition factories. The distinction between the civilian and the soldier in modern war does not exist, any more than, in law, a distinction is made between the man who shoots another, and the woman who hands him the loaded revolver and spurs him on to the act.

Logical statements such as these are liable to bring down the wrath of professional peacemongers. This is not surprising, for if we could study war logically, it would cease to exist. War is the result of false sentiment and human nature. The same illogical sentiments govern the use of weapons. In the next war, the attacking nation will not hesitate to use the best available, regardless of pacts, treaties or international laws. War is itself a breaking of the law of decency, so that to expect a law-breaker to observe a treaty is like expecting an armed burglar not to use a motor car with which to escape. No law is of use without armed police for its maintenance. It would need much war to decide by whom this force

is to be supplied. Civilized nations have only to disarm to find themselves at the mercy of hordes of relatively unarmed savages who are even less interested in Leagues than ourselves.

It is difficult to forecast the weapons of the next war, because we are apt to be influenced by what seem important inventions to-day. In one forecast of a next war, in 1900, for instance; it was stated that bicycles would be the great means of transport; actually, they were very little used; and it was the motor which eventually dominated the last war, so that, although many of these early forecasts showed remarkable vision, it is not easy to particularize.

Aeroplanes are generally supposed to be the most important weapons of the future. The popular picture is of some two or three thousand aeroplanes of all types rising in the air, flying over the enemy's country and devastating it with high explosive, gas and bacteria. This is probably the method that will be attempted. Silent aeroplanes will rise to unprecedented heights and operations will probably be carried out from far more than twenty thousand feet, safe from anti-aircraft guns. But here the weapon is so obvious that every civilized nation will be ready to compete. In many countries, training of citizens for gas attack is being carried out, even while the country's delegates are signing pacts abolishing chemical warfare. Defence aeroplanes will be as fast as those attacking, and probably armed with new weapons, such as the aerial torpedo for big bombers. Controlled by wireless, these torpedoes will

hit with certainty any target, even when quickly moving.

Forts may be built in the air above big cities. These would be supported by helium bags, each very small so that the puncturing of one by a bullet would make little difference. They would carry small guns firing shrapnel, machine gunners and flame producers. Although air is more compressible than water, it is possible that we shall have aerial depth charges, which, exploding with terrific force, will shake to pieces any aeroplane within a hundred yards. Another weapon which will be developed is the aerial gas shell, not only filled with lethal gases, for military pilots will be equipped with gas masks, and poison is soon dissipated in mid-air, but with explosive gas, which will be ignited by a spark a few seconds after the shell has exploded. The flame will flash several hundred yards and the rapid expansion of the air by the heat will probably throw out of control many aeroplanes which are not actually hit.

There are many replies to a bombing attack, and I see no more reason for regarding the aeroplane as invincible than for thinking that the tank cannot be disabled. The weapons which we prize to-day will probably be rendered impotent to-morrow ; this was the case with the forts of Belgium. If military commanders had not always been twenty years behind the times, wars would have been over very much more quickly. A tank was described in some detail quite ten years before the Great War. Yet it took two years of fighting and practical demonstrations to prove to those in command that a man

encased in steel, using caterpillar tracks, could be more effective than a man without protection, using a rifle, and stuck in the mud. Submarine tanks are another interesting possibility.

It may be that the most terrible weapon of the next war will be not the high explosives, gases and germs which we suppose, but the power of suggestion. The only people who have experimented in this direction to any extent are the logical Russians. They realize that wireless is not only a method of communication, but a great psychological influence. The attacking nation will probably switch on programmes at a gigantic broadcasting station so powerful that it will drown everything else on the æther, and by the power of suggestion obtain complete control of the civilian population. A panic-stricken government, who had not foreseen this emergency, but had been busy experimenting with new gases, would hastily try to withdraw all licences, but such would be the power of the broadcast programmes, that people would hide their sets, listening secretly; drawn like moths to the candle. Before long even government officials would fall victims to suggestion, and a bloodless internal revolution would give control of the country to the enemy. Thus it would be possible for a foreign nation to win a war without firing a shot. All war is reminiscent of comic opera at some stage.

Programmes on the television screen may show the whole of the home army and navy being wiped out by the opposing forces, this could very easily be faked in the studio, but a nation which believes what it sees and thinks that a voice coming out of a trumpet

in a darkened room *must* always be that of a spirit would be easily deceived. Talk would point out the folly of rulers, and by suggesting day after day that annexation would make everyone happier, eventually gain its point. We know that the rather haphazard propaganda of the Great War played an important part and that but for wireless, the Great Strike would have been successful. In the future, it is probably the nation which rules the æther, rather than the nation which rules the waves that will dominate.

Of course, to every weapon of attack, there is a defence. Possibly, the home wireless stations will be ordered to jam so hard that many people will be able to hear nothing at all, but a well-directed air raid might quickly put these stations out of action, and as it is on big industrial towns, forts and ports, that defence will be concentrated, there can be little opposition to enemy attacks on far-spread wireless stations. The televised pictures of the chief broadcasting stations lying in ruins with the engineers dying from gas poisoning would add weight to the propaganda.

When propaganda warfare becomes properly developed, governments will have to issue new D.O.R.A.s forbidding listening to rumours and making the concealment of a wireless set a capital offence. The enemy, of course, will thrive on this, for when all news is suppressed it is possible to start the most outrageous rumours, which are eagerly believed. On the other hand, if the government of the future educates its children upon scientific lines, the public

will be able to offer more resistance. The average man of to-day would, I feel, make a very poor showing in a battle of suggestion. His willingness to believe in bearded women, inanities poured through the medium's trumpet, men who claim to perform miracles, and inventions which have overcome gravity, indicate that he is an easy prey to the cunning thinker.

The weapon most popular with the writer of prophetic scientific fiction is the death ray, and I would not like to say how many gallant heroes of fiction have been killed for the secret which would enable their country to wipe out armies with a piece of apparatus no bigger than a searchlight.

As far as the death ray, as generally imagined, is concerned, I doubt whether much notice will be taken of it when it is discovered ; for long before wireless waves can be concentrated in the desired way, to disintegrate matter, they will be used to carry power and light, and the world will be on the verge of the age of local peace.

It is generally overlooked that the wireless death ray implies knowledge and methods of control which will enable many seeming miracles to be accomplished in other directions and that before the military can secure the invention, civil engineers will be using it for transport, communication and the spreading of the fruits of the earth. Even if we own the death ray, we shall not want to use it, because we shall know and understand the people of other nations.

There is more practical possibility in the supersonic

ray, a sound of 300,000 vibrations a second. The limit of perception for the human ear is far below 20,000 vibrations per second, so that the supersonic wave is well above even the shrill squeal of a bat and the calls of certain insects which are inaudible to human beings. The result of experiments carried out in secret is said to be that a sheet of glass was turned to white vapour by a sound of this frequency, and that a frog placed on the vibrating crystal of quartz died instantly from coagulation of the blood. Perhaps untrue, though definitely suggestive.

Theoretically, there is nothing impossible about the sound death ray, but it will not be carried into practice under laboratory conditions. An enemy airman is hardly likely to be obliging enough to sit on a vibrating crystal, nor the infantry to remain still and unprotected while supersonic gunners take their range. Air is a very compressible substance, and the energy of the ray would very soon be dissipated. Even if at close quarters the ray might prove as effective as a knife or revolver, over greater distances its use would probably be restricted to the sea. Water is less compressible and it is possible that the battleship of the future will be attacked by a submarine carrying as its only offensive weapon a supersonic projector, which will crumble up all modern armour into dust.

The search for the perfect offensive weapon is in reality somewhat futile. For every attack there is a reply. The wireless torpedo might be neatly caught in a magnetic net or thrust aside by jamming. The supersonic "torpedo" might be combated by making

certain parts of a battleship of pulpy material or by supplanting steel plates with protected eel grass, which has a remarkable power for absorbing sound waves. The new gas brings forward a new mask ; the bacteriological bomb stimulates research into immunity, so that a town might be bathed in typhoid germs without a single person catching the disease. Germs are only relatively deadly, as the disappearance of leprosy and bubonic plague from England has established. The children of vaccinated parents, when breast fed, are often quite safe from smallpox.

It is easy to build a very terrifying picture of the war of the future. People say that science has made war hell. My reply is that war always has been hell, if by hell you mean a filthy, wasteful business. The great triumphs of Alexander the Great, the Battle of Waterloo, the Battle of Jutland and the Battle of the Somme were all "hell," and I do not suppose that a soldier at Waterloo who had his feet removed by a chain shot, felt that war was any less beastly than the soldier who was gassed on the Somme.

The future will show that all the politicians who talk about the limitation of armaments are barking up the wrong tree. It will show that if they had had the courage to say : " War is hell, and the worse we can make it the quicker it will be over," the world might have been saved. They will not always waste time discussing whether a man should be killed by a gun of 16-inch calibre or a weapon which only throws a trifling shell of 8 inches. They will discover that, logically, if you can make a pact to outlaw any particular gun, you can outlaw every

weapon. But politicians know that no one will observe a treaty when it no longer pays them to do so, and that poison gas is not the only disgusting affair of modern warfare. More civilians died in Germany from the results of the blockade than were killed in England by air raids. Why should it be "unfair" to poison a man, and "fair" to starve him to death?

The modern sentimentalists will go down to history tarred with the same brush as a certain knight of France who had the misfortune to live in the time of gunpowder. His hatred of gunpowder, which he considered an unfair weapon, was so great, that he had all gunners taken prisoner, and slowly put to death!

The world will never secure peace by means of pacts, conferences and treaties. Every treaty is a "scrap of paper" unless the spirit is there, and the spirit will only arrive by education in the widest sense of the word. While there are "foreigners," there will be wars. We should educate our children to eliminate "foreigners" from their minds, to understand the characteristics or habits of others, and not to want war as a means of logical self-aggrandisement.

Many people will say: "No one wants to fight." The answer is why do we keep an Army, an Air Force and a Navy? To protect ourselves? Then we *do* want war—if someone else attacks us first! We offer up lip service to peace, and faithfully remember Cromwell's advice to put faith in God, but keep the powder dry. All statesmen attending peace

conferences are usually busy with their powder. They are clergymen fitting lightning conductors to their parish church.

In the future, no one will honour war. Soldiers, if there are any left, will not be allowed to wear gay uniforms. The people of the future will grasp that as long as soldiers are dressed up in uniforms which give a false idea of dignified importance, taught that thrusting a bayonet into a man's stomach is something worth doing when it is "serving your country," so long shall we have war. The military must fight occasionally or the excuse for their existence disappears.

I blame no one for joining the Army or Navy. Life is now made so comfortable for sailors and soldiers of all ranks, that the wonder is that the whole nation does not join the Services. The blame rests on the people who talk peace and become thrilled at the sound of a big gun firing or fifty soldiers walking like automatons in time to a regimental march.

Before and after the war that ends war, there will be others. They will be terrible, as all wars have been. And it will not be war that ends war—the phrase merely shows our incapability of talking sense on this subject. It will be education that ends war, and before we can have education, we must learn to face facts, however unpleasant. I think the people of the future will find it difficult to say who is the more dangerous to the community, the warmongers or the peacemongers; the efforts of both must end in war by reason of the variety which supports both camps.

I cannot help thinking that we shall be more honest in a few hundred years' time, and that science will improve our moral logic. We shall see that trees fight, that crystals, vegetables, animals and men all tear each other to pieces when the desire to have and to hold is uppermost. It is childish to pretend that colonization is made practicable by peaceful penetration or that law and order can be maintained without violence.

Prisons are excellent examples of the use of force. If a nation kept its gold reserve on the sea shore for all to help themselves, currency would lose all present meaning. The struggle for individual progress, which we call industrialism, is a form of war as cunning and as beastly as that of the trench or gun.

The passing of time will bring to life a people who do not mouth Christian platitudes, who will not allow bishops to bless cannon in the name of Christ. They will grasp that, if scientific lighting and strong police were removed from any city, the spirit of kindly charity would not remain too long.

The "agony of war" makes a pretty phrase, but the study of history suggests that warfare has been a not altogether unmixed curse. In the days before machinery made the support of a large population possible, warfare was a very natural alternative. In more civilized times, fighting has given a tremendous stimulation to progress. How much research has been carried out on the alloys of steel, purely for the purpose of improving guns and armour plates? How much investigation into rare chemicals for poison gases, or in physics for X-ray tests upon

warlike material? The Great War made the aeroplane. The little canvas and bamboo affairs that went into action in 1914 emerged trustworthy machines. More progress was made in those four years of war than would have been made in ten years' peace. The results are evident in our homes, where every radio set is a reminder of the war's intensive development of scientific apparatus.

I do not say that for this reason warfare is a good thing. But up to a certain stage in civilization, it is a common process, and no more "cruel" or "wicked" than many other natural effects. A tree will shed a thousand seeds in the hope that one may survive. An oyster produces two million young, of which two only grow to tickle some gourmet's palate. In the future, warfare will be recognized as just as "natural" in a diseased body as mumps or measles. It is not the disease which is wrong, it is the body, a fact which even doctors and politicians must eventually grasp.

The last war made it so very clear that the really difficult jobs were, perforce, carried out by civilians and that the novel weapons or the best ships were designed by merchant firms. Before long, the very idea of a non-combatant will be absurd. Enlightened people would not say "women won the war at seven pounds per week, don't bomb our defenceless women," all in one breath.

If aviation and all rapid transit does not cure war by intermarriage, we shall soon see fighting upon a really interesting scale. Nations will prepare by sterilizing the menfolk of their enemies twenty years

in advance ; not a house, not a child will be safe for one moment. It will be a war of brains and force ; so ruthless in its logic that all others will seem as nothing.

It is my honest opinion that war is a direct and obvious result of the inequality of man. I believe that until mankind achieves an outlook godlike in its kindness, even the broadcast of horrors beyond conception will not stem the vanity of battle. I believe that if this earth were one communistic state, our main taxation would be directed to the upkeep of armed expeditionary forces with the object of bringing before other planets the peculiar advantages of our own religion, our own government and our own delightful system of civilization.

CHAPTER XI

Doctors and Surgeons

PROBABLY no branch of science has made greater strides in the last century than medicine. Yet I feel that, of all the sciences, that of healing is the least advanced and the most likely to make the greatest changes in the future. In the last hundred years, the principles of antiseptics, anæsthetics, immunity and anti-toxins, have been discovered. In spite of this, millions of men and women die every year from heart disease, five mothers in every thousand give their lives for their children and every mother suffers agonies which more sensitive man would find intolerable. A common cold can incapacitate an intelligent person for three or four days, and our lunatic asylums have never been so full.

In the near future, doctors will concentrate more upon the curing of our ills rather than causing such symptoms to disappear. I do not think that the system suggested by many Utopians, that doctors should be paid for keeping their patients well instead of curing them when ill, is ever likely to be adopted. The reason is plain. No man would be prepared to carry out his advisor's instructions for keeping well. If the object of men and women is to be healthy *at all costs*, they know the secret now. But we have

not yet sufficient control over our emotions to resist the appeal of lobster mayonnaise and champagne.

Preventive medicine will become the most important branch of this science, for it is better to hold back illness from any man than to "cure" after he has succumbed. The causes of many illnesses are quite outside the doctor's control. He cannot pull down the slums and build houses fit for heroes to live in; even politicians can only *promise* this fine result. It is surprising, when we read of seven people sleeping in one room, three or four in a bed, that such diseases of insanitation as bubonic plague have disappeared. Nor has a doctor real power, in certain cases, to enforce segregation. Scarlet fever and similar diseases have become rarer because the sufferer can be legally isolated. But a father infected with tuberculosis may continue to live in a house with children who have not acquired immunity. The white scourge is curable to-day. With sufficient courage and the same kind of ruthlessness that makes for conscription in war time, the people of the future will probably wipe out "consumption" in two generations. It may be that before this, some means of conferring artificial immunity will be discovered.

One day doctors will concentrate upon the important studies of protection and hygiene. Their decisions, confirmed by a court of law, will be enforceable. To-day, they can "certify" the insane and insist upon the isolation of sufferers from certain diseases. But they can do nothing to the wealthy drunkard who, although his disease is not infectious, makes the life of his wife and children a living hell.

It is true that a man can be imprisoned for being drunk, but you will find that very few moneyed people suffer in this way. If you can afford to get drunk in private, you are safe from the law.

A thorough understanding of immunity in relation to every disease may eventually bring about a world which is almost completely free from the present types of illness. It is not generally realized that we pay more for sickness every year than for great wars, or that colds alone probably cost Britain £40,000,000 every twelve months, in medicines, inefficiency, and loss of time. It seems that no disease could wipe out the world, for constant contact with germs, in a gradually increasing degree, endows a person with the power to resist their attacks altogether. The same effect can be found in other directions; for example, dwellers in the Fen Districts who have drunk the local water from an early age never suffer as a result; but a townsman accustomed to comparatively pure water would quickly be poisoned. Poisoning, whether by chemicals or bacteria, is a relative matter. If you eat enough bread, it will poison you. On the other hand, by taking increasingly large doses over a long period, it is possible to eat eight grains of arsenic without suffering great harm.

Once immunity is understood and controllable in connection with every known disease, it may be possible to make a single inoculation in a child sufficient to protect it from any trouble resulting from infection. There will always be the danger of new diseases occurring, but these will speedily be tackled by the doctors of the future and methods of

conferring immunity discovered. Freed from the menace of infectious disease, man would be able to lead a finer and more complete life. A better reason for seeking health than the desire to enjoy indulgence without payment.

The people of the future will not make the mistake of seeking health for health's sake. The young man who lifts dumb-bells and contorts himself on the floor in a "daily dozen" says that he does it "to keep fit." Ask him "Fit for what?" and he is puzzled or unable to answer. He thinks that fitness is an end in itself, as if man were a racehorse or a pedigree dog. Obviously, if a muscular body is the ideal, many South Sea natives are far ahead of Europeans. Fitness and health are not ideals in themselves. The man of seventy who boasts that he "has never had a day's illness in his life," will be ignored in the future. It is the man of seventy who has done something with his life who will be in demand.

The cry for fitness and health is characteristic of an intermediate stage. Our ancestors had to keep fit, because their lives depended upon this condition. But to-day a man can buy his breakfast at a restaurant and the strength required to pull the trigger of a revolver in self-defence does not justify spending valuable time in developing the biceps. It is on the minds of their patients rather than their bodies that doctors will eventually concentrate. The bulging muscles of the athlete will no longer be an object of worship. They will be savage. Men will do exercises for their minds instead of for their bodies, and for those

who still care for the exhilaration of physical "jerks," doctors will devise imaginative studies which will be performed while lying quite still on the bed. The patient will believe that his body is performing all the contortions he likes, and the result will be exactly the same as if he had carried them into practice, but without the same hopeless waste of energy.

To-day, a larger number of people acknowledge a creed which says in effect that if you do not believe you are ill or in pain, you will *not* be ill or in pain. The whole difficulty of this faith, in practice, in the present state of the human body and mind, lies in the word "believe." It may be perfectly true that faith can remove mountains, but our brains are not yet sufficiently developed to allow us to have such determination. Our bodies control our minds too much to allow a tumour or septic appendix to be destroyed by thought. As the human mind grows, and the brain becomes bigger while the body grows smaller, this ideal state may actually come into being. Then, of course, every man will be his own doctor and cure himself. Medical men will confine themselves to sick criminals and the direction of other people's minds.

The stomach will take countless centuries to die. To short circuit its work by means of tabloid energy is not only impossible at present, but neglect of mechanical functioning would destroy the capacity of the body to extract nourishment in assimilable form. So gross is the body and so feeble the mind that it is foolish to expect control over matter by thought.

The brain is, even now, the least understood organ

of the body, and doctors in the future will concentrate on an attempt to discover its principle. It may be that they will find thought to be little more than electro-chemical reaction, and they may succeed in mechanical interference. At present, our knowledge of the brain is almost wholly destructive. We know that by injuring a certain section we may destroy a sense of smell or taste, but we do not know how we can transplant brain substance so that the man with no ear for music becomes a skilled violinist or the religious bigot a tolerant philosopher.

It may be possible to inject knowledge into the brain, or by treating it with suitable rays to secure any particularly desired result. Instead of consulting the schoolmaster about the most suitable profession for his son, a father will telephone the family doctor, who will advise a visit to Sir Somebody Somebody (BXT101), the medico-engineering specialist. Having determined that the boy's brain is of the required capacity, the specialist will perform a simple and painless operation which will induce an intense desire to be an engineer and give him the special qualities necessary for success in this profession.

In the immediate future, far greater attention will be paid to healing by suggestion, not in the way of the faith expert but on scientific lines calculated to adjust the chemical or electrical deficiencies in the brain which give rise to a malady. Brain surgery on a large scale may be possible only with the aid of high speed æther oscillation or with rays which penetrate the skull and act on the cellular mass. Far greater progress in this direction would already have been

made, but for the objections to experimenting on human subjects. These difficulties may be overcome by the successful transplanting of brain matter, which will be kept alive in a suitable solution during the period of the experiments. Surgeons are far too busy looking after out-of-date bodies, instead of preparing us for the time when many present-day organs are atrophied by disuse. Teeth will soon need treatment at birth and need simultaneous removal with the appendix.

I have dealt briefly with the effect of certain vibrations on the human body and mind by means of radio-activity of various types. I do not doubt that tremendous strides will be made in this direction and that doctors will be equipped with apparatus for emitting rays which rapidly heal such small but irritating ailments as headaches and depression. The cocktail of the future will be served, not with a cherry in a glass, but with a valve in a screen.

It may be found in the future that all illness is infectious. We know now that it does not always require some germ to produce infection. Merely speaking to a man suffering from a fit of mental depression may make you feel ill. Here the power of suggestion is for evil, and it may be that certain troubles whose real cause we do not understand, will eventually be found to be transmitted in this fashion.

Surgeons will have fresh triumphs and by discovering how to keep living matter growing in artificial surroundings, will perform operations which will postpone certain death for many years. I imagine, for example, that instead of wearing clumsy

spectacles, the men and women of the future who are unfortunate enough to be short-sighted will have an operation performed, and either the relative positions of lens and retina adjusted or a minute artificial lens inserted. Instead of being fitted with clumsy false teeth, they will have teeth transplanted into the gums—this operation has already been performed—and no doubt the deaf will be given new ear-drums of a mechanical kind. In a few thousand years, the hairless, toothless, but not brainless, flapper of eighteen will have atrophied the many parts of her body which to-day are responsible for so much irritation and inconvenience to her appetite.

Worn-out organs in the body will be replaced by new ones. Life and vigour will be restored by gland grafting, which will also heal many disabilities common to-day. I visualize a number of embarrassing lawsuits by which the wholesale exchange of human commodities will be restricted as effectively as sweepstakes. From the more desirable aspect there will be opportunities to succour the husband whose wife has grown cold, to cure the unfortunate neuter or, best of all, to construct a body which meets the mental and sexual needs of the moment.

Doctors will be called upon to study the miseries of women and decide how best they may be avoided. Equality of sexes is impossible while the one has all the trouble of child bearing. Many women are injured for life by their effort to continue the race and all endure great inconvenience and pain. At first, doctors will probably concentrate upon alleviating the pain and dangers of child-birth. They

might have succeeded long ago but for the religious prejudices of those who quote the text "In pain and sorrow shalt thou bring forth children" and interpret it as meaning that the use of anæsthetics is "wicked." In many cases, women themselves have a superstition that unless pain is suffered, a mother will not "love" her child. These follies have been responsible for much suffering.

The women of the future will realize that pain is a terrible, energy-sapping horror. They will know that to use the discoveries of science to avoid pain is not cowardice, but common sense. It must be confessed that the modern swing of the pendulum is in the direction of avoiding all responsibility in these directions. One has but to listen to the hurrying feet of women workers to realize that the exchange of rights for which they have fought is not entirely one-sided.

Easing the pain of motherhood alone will not eliminate the disabilities incurred. The next demand will be for a reduction of the time during which inconvenience is suffered. There are signs that nature herself may perform this work naturally as a result of the strenuous life led by many modern mothers, but in any case, it will be accomplished by doctors without danger to the child. Large incubators in which children will mature, will be installed in every hospital, being artificially fed on a scientifically-arranged food suitable for the work in life upon which they are to be engaged.

The final stage will be the introduction of ectogenesis in which the mother suffers no more difficulty

than the father. It is not until this time, many centuries hence, that men and women will be equal in fact as well as in law. At the present moment, the chivalrous attempts of the male population to admit women to normal public life have led to a somewhat absurd position. It is brutally obvious that the female is totally unfitted for work which requires the continuous application of a balanced mind. Women judges and women soldiers would, on the average, be worthless to their country. They do not yet play a part in the world which justifies the astounding advantages presented to them by suffrage, or by laws which permit men to be called to account for the delinquencies of their wives. Unfaithfulness is far less serious in the case of the male; it is but a short time since regulations for divorce attempted to counteract the wiser provisions of nature. Men and women will grow more alike, but until the emotional and physical reactions of both sexes are identical, a comparison of their abilities is merely a pitiful attempt by masculine women to justify the absurdities produced by change.

Doctors themselves will change very greatly. In the near future, I expect to see the complete disappearance of the black bag and top hat tradition. It is ridiculous that doctors, who are the one class of people that should understand hygiene, should, with some few exceptions, wear the most insanitary clothes. Possibly, in the future, a doctor's clothes will be subject to microscopic examination by Government inspectors. I shudder to think what such an inspector would find if he examined the clothes of the average medicine-

man of to-day. In the turn-ups of his striped trousers might be found enough germs to kill a household, and the rim of his top or bowler hat would probably be a museum of bacteriological specimens. During the last hundred years, doctors have learned to sterilize their hands after examining every patient, but moustaches and beards are still permitted. Quite apart from the fact that a reminder of his "fishy days," when whiskers were used to strain sea-water in search of food, may upset the patient's psychology and therefore harm him, the fungus is likely to harbour disease or dirt. It is most difficult to sterilize at frequent intervals.

Gangrene and other terrible diseases have been practically wiped out by the adoption of sterile methods in the operating theatre. A large number of women still die every year from poisoning during child-birth, and because our knowledge of bacteria and filter-passing viruses is still incomplete, we do not know what is being carried from sickroom to sickroom by doctors.

In years to come, the doctor who wears a sterilized white coat and trousers, rubber shoes and rubber gloves will no longer be considered a quack. He will discard his clothes after examining each patient and they will be sterilized before being returned to him. He will not carry a black bag to impress his patients or write his prescriptions in a dead language, in which some of the symbols are so alike that many patients would have received poisonous doses but for the watchfulness of a dispenser.

Medical examination will probably be compulsory

at stated intervals for all men and women in the near future. Every man or woman who dies prematurely is a burden to the State. It costs about £100 to give the lowest type of so-called education to the workers' children. Quite apart from humanitarian principles, it is obviously wasteful for a child on whom the State has spent money to be allowed to mature and die at an early age. Doctors claim that most deadly illnesses could be cured if caught early enough, so that concealment of any illness will certainly be a serious offence. One particular type of disease which is exceedingly common could have been eradicated long ago if it had been made a criminal offence to conceal it, or if it had been tackled openly and fearlessly instead of allowing it to form the subject of lewd whispers.

Hospitals will not be allowed to depend on sweepstakes, bazaars, and flag days for their existence. Good health should not be a matter of charity, but of conscience. But when the various reforms have taken place, the hospitals may only be filled with criminals for surgical treatment and prisons will contain a few men who were sentenced for sneezing in public or failing to notify the contraction of some savage complex.

Medical knowledge has increased so greatly that it is now impossible for any doctor to be "up to date" in every subject. Probably, in the future, doctors will be divided into those who diagnose and those who treat. The general practitioner will disappear and his place will be taken by a man specially trained for diagnosis, who will pass the

patient to the specialist in the particular illness concerned.

It is a terrible thought that some surgeons charge two hundred guineas for an operation which others will perform for twenty. Is it that the two-hundred-guinea surgeons are ten times as good as the others? If so, it seems that health, or even life and death, is very much a matter of capital value. Obviously, if, in the future, any surgeon is found to be worth two hundred guineas an operation, he will be paid a very handsome salary by the State, so that his services will be available to the poor, who are possibly more worth while keeping alive than the rich. If, on the other hand, it is not found that he is ten times better than his colleagues, the appropriate authorities will probably prosecute him for profiteering. The idea that it is only practicable to corner meat or boots is lamentably out of date.

People will pickle their bodies and feed them electrically. Round a vast chamber, instead of mummies will be "pickled death" and by paying a charge to the Government Laboratory, a body will be brought to life for short periods, and by being electrically fed, the heart and part of the brain will be able to work. It is doubtful whether the mind will be able to be operated other than to say things which had been said or thought in the past lifetime. It only wants an extension of time available to repeat the experiments so successfully made in Russia, when a dog continued to eat after it had been beheaded, and honour has to-day been awarded to a scientist who, by injecting short æther waves to their hearts,

has brought back to life two men who had officially been pronounced as "dead."

"Death pickling" may be useful for those who, like the Egyptians, are able to afford it, but with the difference that the patients could be brought to life again by the aid of electrically-compressed air and artificial blood flow, so that things upon their minds before death could be spoken.

Perhaps, the biggest task which medical science has to face, and which at present it shirks, is insanity. For thousands of years, the insane have been regarded as virtually incurable, and it has been considered necessary to shut them up with others who are also insane. It is not surprising that there have been few cures. The whole treatment of lunacy is based on the segregation of patients rather than any attempt at remedy. Whereas great progress has been made in the conquest of nearly every other affliction, insanity has been the Cinderella of medical science. The increasing number of sufferers from this terrible malady will force action. The burden of supporting thousands in lunatic asylums will become too great for the State.

Rays, special diets, hypnotism, and even delicate operations will be tried, and I do not doubt that, when the most brilliant research workers give themselves to the task, many more forms of insanity will prove curable. In the near future, there may be a decrease in the number of the insane through the introduction of sterilization, but it is not at present certain whether insanity is definitely hereditary in every case. Our lunatic asylums in which thousands

suffer imprisonment passively and in which no real attempt is made to help, are a blot upon the fine record of medical science.

One visualizes an amusing era of medicine and rejuvenative surgery in a few thousand years' time. Plays will be staged in which the hero returns to his garret and drops a bag of national sweepstake bonds upon the table, with the words: "I've sold it, Maggie." Disappointment, tears and curtain. Or we may see the wife creeping into the nursery with her permit; surreptitiously injecting the serum for red hair and engineering, instead of blonde-poetry.

Unless we have so reduced the need for exercising our teeth and our stomachs that tabloids are sufficient, Voronoff's methods may prove the saving of our meat supply. No one will worry about the "medicine-man" methods of our modern doctor, who has never forgotten that hairs from cows' tails swallowed by moonlight were prescribed only a few years ago in his honourable past.

I think that the whole medical profession will in the near future concentrate upon the ailments of women. We cannot maintain the farce that men and women are equal in any way until the disabilities of the female are removed. Legislation cannot give brains to a sex when intelligence has been denied to them by countless centuries of evolution. Indeed, it will not surprise me to find that the ætheric signals of affection, now little removed from the condition of animal desire, are to be utilized as the most potent force to which nature is subject.

CHAPTER XII

Sports and Amusements.

FEW people realize that sports and amusement form one of the biggest industries in the world. I read that £44,000,000 a year is spent on hitting a small ball into various holes—golf. Many more millions are paid every year for football, cricket, tennis and other games. Places of amusement like the cinema and the theatre represent a colossal capital value. Will this be the case in a few hundred years?

I do not think that the people of the future will make the purely arbitrary difference between work and play which generally exists to-day. Why should hitting a nail into wood be work and hitting a ball into a hole be play? One man plays cricket and calls it amusement. Another calls it work. There would really be the greatest difficulty in finding anything that was amusement and nothing else. Even sitting in a comfortable seat at the cinema becomes work when it is carried out by a critic who is paid to tell other people which films they ought to find amusing.

In the future, there will be no distinction between “work” in the sense that we use the word, and “play.” It may be that our children’s children will regard every occupation as work, or, far more probable,

that they will refuse to be associated with anything that is not definitely play. The distinction is entirely a matter of point of view and not in the least important.

The proverb that all work and no play makes Jack a dull boy is not true unless work is defined as doing something you do not want to do in someone else's time. But the science of amusement has been so neglected that more and more people are talking of work as "a tonic" and there was probably never such a time when work was so sought after, not only as a means of earning a living, but of occupying the mind. Most amusements and games have been designed to give the mind as little to do as possible, the idea being that thinking and playing were incompatible. Now it is gradually being realized, and it will be more appreciated in the future, that to allow the brain to idle is the surest way to mental and physical degeneration.

The primitive passions for which sports were invented will have been brought under control, and it will be appreciated that to satisfy blood lust is no more "play" than over-eating or drinking. It is not long ago since men thought it was "play" to ride against each other with spears or fight with swords. A little further back it was considered "sport" to see men kill each other or torn to pieces by lions. We are a little more advanced to-day, in that executions are carried out comparatively scientifically and before only a selected audience, but the destruction of life is still amusing to a good many people. Fox hunters, who occasionally try to justify

their barbarism, say that the "fox enjoys it," just as, of course, the Romans used to say the Christians enjoyed being torn to pieces by lions. Personally, I believe the Christians enjoyed it more than animals, because they had, at least, a faith, but the fox has nothing to comfort him as he is bitten to death. I very much doubt if idealism will go far in the future. Faith may not appeal as a mental exercise to people who will grasp that actions need not necessarily accompany belief. It is not always jesuitical to argue that a martyr should run and live to preach another day.

Blood sports will have disappeared in a few years and foxes will, if necessary, be destroyed scientifically. Our children will be revolted at the idea of young girls being "blooded" by having the still warm blood of a fox dabbed on their faces, and hanging the tail in the dining-room will be considered as an example of bad taste only comparable to the placing of an excised appendix on the mantelpiece. If men and women still feel it necessary to satisfy a primitive instinct of the chase, they will, no doubt, obtain the same amusement from pursuing a mechanical doll by motor car and "killing" by running over him. The idea of carting a tame stag to some country spot and then chasing it on horseback will seem, not only revoltingly cruel, but incredibly stupid, especially when the stag, which has been treated as a domestic pet, stops to enjoy a nibble of grass, quite unaware of the fact that he is expected to run before the hounds!

An intermediate period of mechanical sport can be

expected. Chasing an electric hare has already largely taken the place of coursing with live "rabbits," and the more humane of marksmen prefer a clay pigeon, mechanically thrown into the air, to a dazed bird released from a cage. If it is absolutely necessary to kill, inventors may provide clay pigeons, automatic foxes and mechanical stags, with blood which will be released on a kill being made. No doubt the liquid will be nicely scented and sterilized so as to satisfy those who sprinkle it on their persons in an atmosphere of Tally Ho, whisky flasks, good fellowship and Yoicks.

It is already apparent that skill and success in many sports depend more upon the scientist than the so-called sportsmen. A minute improvement in the construction of a rowing boat, for instance, may add a mile an hour to its speed through the water and enable better results to be obtained than with a crew of Carneras. In the future, foolish limitation to scientific progress in the implements of sport will not be imposed. If the object of rowing, let us say, is merely to exercise the muscles, it would be best to have a heavy tub, quite unstreamlined, placed in a small pool. The pull exercised by the crew could be measured on a meter, and there would be no need to hold up the traffic of a river for several hours to discover which was the more muscular of two outfits.

Instead of this, skilled engineers are employed to design boats on scientific lines. Obviously, this is not the accepted idea of "sportsmanship," for it might be the degraded technician and not the crew

who won the race. When sliding seats were introduced, a great increase in pace resulted. But if one mechanical device is allowed, why not another? Why not permit an auxiliary motor; in fact, why not give it all up and go in for high-speed motor boat racing, which has, at least, the advantage of being of practical use.

In the near future, rowing one boat against another will be regarded in much the same way as tilting the quintain is to-day. We should laugh at the idea of marksmen at Bisley using a bow and arrow. Why do people go in thousands to see eight young men rowing a boat, when many excellent engines are available? It is obvious that science and sport cannot be separated, and the present hybrid arrangement is unsatisfactory to all. One day it will be the designer who shares the prize, and sports will become matches of one scientist against another. There will be no need to have actual contests, because laboratory measurements can show the performance of whatever apparatus has been designed, and a comparison enable the winner to be declared.

There is an idea that the element of "luck" or chance in sports makes them acceptable to most people. If this is the case, it is surprising that so much money is spent on eliminating the possibility of luck. Thousands of pounds are spent on making cricket and golf grounds as scientifically perfect as possible, whereas the element of luck would be much greater if we permitted a large number of bumps on a cricket pitch, and left worms to do their worst on the golf greens. The scientist is paid to make a

billiard table as flat as possible, and the ball as near a true sphere as the latest measuring instruments can determine. In every sport and pastime, from tiddley-winks to tennis, the highest possible degree of mechanical efficiency is required.

In years to come, it is mechanical efficiency, rather than the use of it, which will be called sportsmanship. Probably, the greatest brains will amuse themselves by working out theories for streamlining boats, while the lowest types of criminals will be kept to use their arms. In the same way, producing a perfect piece of grass by means of chemical manures may be the sport of the horticulturist, while those of a lower mentality will use the scientifically-designed clubs to hit scientifically-designed balls into electrically illuminated holes. Golfers of the future may even be accompanied by expert surveyor-mathematicians, who will point out the proper lines of approach to a hole and work out the allowances to be made for gradients or wind. Both, of course, measured by instruments.

Since the only possible distinction that can be made between work and play is that you are paid for the one and not for the other (which makes it all the more surprising that most prefer play), it is probable that in the future all work will be play. Gardening would be "play" to the miner, but the gardener might enjoy playing cricket, while the professional cricketer might find it amusing to dig coal. Cunning governments could probably get all their work done in the name of play !

It is very probable that the truth of the old statement concerning change and rest will be re-discovered.

Holidays often do more harm than good, because the busy man from the city feels that he should allow himself to idle for three weeks, and it is not surprising that September and October are the doctor's two best months. A brain accustomed to working suffers if it is suddenly given nothing to do. The man who exchanges an office desk for a deck chair overlooking the sea and tries to "loaf" for a fortnight is likely to become ill through sheer inertia. The amusements of the future will be designed to exercise the mind, and it may be that the business man will find the solving of quadratic equations more "amusing" than knocking three ivory balls about on a green table.

With the subject of games is inevitably combined that of happiness or pleasure. Many people have made themselves miserable by seeking for happiness, but our descendants will realize that happiness has nothing to do with pleasure, sport or work, and that it is no more than a mental attitude. It may even be possible for psychologists to give courses in happiness. Bank Holidays will no longer be devoted to a wild hunt for pleasure by over-eating and drinking. The brains of the men of the future will be so highly developed that they will not need to see plays acted. The written word will convey all the sense of drama. Cinematograph films, which will of course be televised, will be written in a kind of shorthand which would probably be quite unintelligible to our lazy minds. One result of the speeding-up process will be the showing of films in which a long story is compressed into half-second shots of each scene. The audiences of the future

will not gape for minutes at an irritatingly repeated caption. A few flashing shots will suggest rather than show, and the thoughts of the audience will have to work to fill in the gaps. To a certain extent, this is done to-day, or else every book would read as if it were written for children. A sudden smell will imply a railway station. "Came the dawn" captions will be no more.

For prize-fighting and wrestling, our children's children may substitute games of suggestion, hypnotism and psycho-analysis. Two competitors may attempt to suggest each other into performing some action, and they will wrestle with each other at mental football. It will not even be necessary for material bodies to meet and the huge cost, not to mention inconvenience, of transporting teams will be eliminated. As with modern chess tournaments, international games will be carried on by telephone, wireless, and television. It may even be possible for two motor-boats to race against each other, one in Australia and the other in England. Simultaneous starting by wireless will ensure both beginning together, and spectators will be able to follow the race by means of a television screen on which one scene will be superimposed on the other.

A fortune probably awaits the inventor of some sport which is useful, and exercises the brain. I do not think we shall care about any game which merely "passes the time" and does not serve a purpose. Tennis and cricket, for example, prove nothing and help the world not at all. But motor racing does at least encourage manufacturers to experiment in an

industry which is of vital importance. Aeroplane racing has, if nothing else, disproved the belief that the human body would collapse at a speed of 200 m.p.h., and it is by racing that the light aeroplane has been developed. Without the Tourist Trophy races in the Isle of Man, it is doubtful whether an efficient thirty-pound motor-cycle would have been put on the market. Motor-boat racing has certainly enabled improvements to be made in the streamlining of commercial craft, with resultant benefits to our pockets and our comfort. It may be that future races between rockets will be the means of developing this new means of communication, although, obviously, no one will trouble to visit sporting grounds when they can sit in the comfort of their armchairs and watch the racing on the screen of a televista.

Physical contests will disappear for the good reason that bulging muscles will be looked upon as a sign of degeneration. A man with the misfortune to be born with a short tail would not go through life comparing its length with that of others, and it will strike the people of the future as somewhat ludicrous to boast of being able to run at ten miles an hour when a car offers you a comfortable two hundred. They will wonder why the men of 1935 troubled to spend their whole lives and thousands of pounds in racing yachts with sails, when a small outboard motor would have taken them along at twice the speed for half the cost. Sports should be in keeping with the spirit of the age, and it is proof that the scientific age has not dawned when we read that a prize fighter is paid fifty thousand pounds for hitting another on the jaw.

A revolver, a piece of lead, or a hypodermic syringe are all far more effective. Skill is not the factor which attracts a crowd to watch unprotected men swinging lefts to the stomach and rights to a broken nose.

Demonstration of the temporary power of matter over mind will not interest people in an age of brain development, when one of the "heavyweights" of the future will be able to suggest a modern prize fighter into unconsciousness with the same ease that a modern man could shoot an armoured knight of the fifteenth century. The most carnal observer of present-day civilization can see that the spurious worship of beef, beer and betting does not always produce the opposite condition to effeminacy.

It is doubtful whether the barbaric idea of paying others to amuse us will survive for many generations. There was logic in the remark of the Eastern ruler who, when told that the Prince would dance at a royal ball, said: "But in my country I pay others to dance for me." To-day, men are paid to play football, to use a bat or persuade a golf ball into a small hole. To pay others to amuse you is a sign of mental laziness. If it were skill which was admired, the motor engineer would be the highest paid "sportsman" in the world, instead of the winner of the English golf championship. Men go to watch prize-fights because, subconsciously, they like to feel that they, too, could hit another man into insensibility. They forget that anæsthetics were invented for accomplishing this act scientifically and inexpensively.

Sleight of hand and skill in manipulating clumsy

rackets or clubs will not appeal in an age when people do not think that seeing is believing and know that machines can be designed to perform efficiently many tasks which the human body does very badly indeed. Golf, if it is played, will be between two radio-directed robots, and the players will remain in the club house, sitting before their control boards watching the progress of the game by television. It will be difficult for the men of the future to conceive the idea of a "sportsman" who takes no part in the game. But, to-day, it is only necessary to present a sufficient number of silver cups to earn the title of "the well-known sportsman." Imagine any logical person using a slow-motion camera to perfect his "swing." It is more funny than a modern Elizabethan house.

Literature and art will probably make great progress, because the men of the future will be able to devote a considerable amount of time to these pursuits. But they will not worry about what is called "technical skill." The artist who spent a lifetime in trying to draw a perfect circle will seem nothing but a fool in an age when the use of set square and compasses is understood, and the writer who would spend a week searching for the perfect word will not appeal at a time when the contents of a book is rated more highly than the sound of its words. The object of words is to convey meaning in the shortest possible time, and descriptions of the Nile by moonlight or the South Seas by sunlight will not make people read when universal television enables them to see the scenes described.

Possibly, detective and mystery stories will be read with the object of improving the deductive powers of the mind; but the brain will have developed considerably, and no author will find it necessary to finish his story when the readers have all guessed the end by page 150. The love story of to-day will have no meaning at all in an age when these things are managed scientifically, and children are born in test-tubes. The idea of "soul mates" will be recognized as a purely Christian myth invented as a substitute for pagan beliefs. Love will be an important scientifically-organized force depending upon wave interference for its understanding. I have little doubt that the science of compatability will be taught, or even demonstrated, in every seminary for young ladies. Correspondence courses will offer a sure and economical alternative. Children will not want to read about fairies and gnomes, but of engines and atoms, and the boy who prefers cricket to a chemistry book will be regarded as an insufferable prig requiring glandular adjustment.

There will be no sports to "pass the time." People of the future will have given that word "time" some very careful thought. They will have realized that it is time that is the foundation of true Communism. Short of rendering a man unconscious, there is no way of robbing him of time. You can tax him until he has not a shirt on his back, steal his money, forge his cheques, but you cannot yet give him other than twenty-four hours a day and sixty minutes in the hour. There is no need to pass the time. Time can perform this feat unassisted. Only the administration

of a drug can make it seem to pass more quickly or more slowly. It is not possible to save time; even if twice as much work is accomplished in the same time as normally, it is the labour with which we juggle. The whole of sport and amusement depends on the time factor. Given unlimited leisure in the present disorganized state of society, I do not doubt that the majority of people would welcome an anæsthetizing drug which would help them to stop thinking until the time came for work again. One drug, alcohol, is used quite extensively for this purpose now.

In the well-ordered day of the future, there will be no wasted time, for æther waves travel at some thousands of miles a second, and most communication and work will be done by their aid. We may discover some suitable drug which, unlike alcohol, makes time slower. The brain of a man, in the opinion of a snail, would seem to live for several hundred years. It may be possible to regulate leisure and work so that, although the number of hours spent on each are differently proportioned, the periods seem exactly the same.

The idea of four people sitting down to a table and distributing fifty-two cards will seem ludicrously hard work in a few years' time. They would prefer to work out all the possible permutations and combinations of fifty-two cards, taken thirteen at a time, by mental arithmetic and let you know the result of several thousand rubbers in a few minutes. They would point out that they have "saved" hundreds of hours in this way, and it would never be necessary

for any player to attend a silent card room again. They would give you the result of a life-time spent at the gaming tables of Monte Carlo in half an hour, and save you the effort and risk of actually placing money upon the tables.

The effect of the really scientific mind on a game of so-called chance was demonstrated some years ago when a young engineer worked out the bias of the wheel of the table and showed that it was possible to break the bank whenever fancy chose. Once science is introduced, the element of luck must disappear and, therefore, quite apart from physical reasons, a completely new set of sports will be evolved, in which there is no luck, and no skill, other than that of an agile brain.

As our bodies are less and less used, sports will become more and more automatic and possibly the motor races of a few thousand years hence will be carried on in a drawing room, the engineer-sportsmen submitting their calculations to the professional mechanics who will act as a board of referees. Any ultimate disagreement will be settled by force in some form, for the excellent reason that war and sport are obvious offspring of the same international source.

CHAPTER XIII

The Religion of To-morrow

TO many people it may seem superfluous to write of the religion of to-morrow. The religion of to-morrow, they will say, is the religion of to-day, and that of yesterday. A faith cannot change. But anyone who has studied history, past, present or future, will have realized that change is the essence of life. Anything that cannot change is destroyed. Perhaps it is the very susceptibility of Christianity to this change which has enabled it to grow for twenty centuries.

If you do not believe that religion changes, remember that polygamy was part of most early faith. So short a time ago as four hundred years, Smithfield echoed to the cries of men and women who were being burned because they disagreed with the Pope or Sovereign upon some minor theological point. To us it seems barbarous and cruel, and we can hardly believe that a faith of love ever countenanced such proceedings. We read with horror of the burning of Joan of Arc as a "heretic," one who did not agree with the Pope and Cardinals. What will our children think of the twentieth century?

They will find that some clergymen who spoke of

gold being as dust drew salaries greater than those of Prime Ministers, they will find that men wasted their time discussing whether or no millions of others, who may not have been "Christians," should be permitted to listen to concerts on Sundays, and whether birth control was a mortal sin. They will marvel that the priests of God should preach sermons discussing the exact authorship of a certain psalm. And they will surely ask: "What did these men do to abolish slums, which caused more unhappiness than all the devils ever imagined by the most fantastic religious maniac? What was their attitude towards the women they passed in the streets, of whom Christ said: 'Let him who is without sin cast the first stone.?' " They will be more sympathetic towards the fanatical monk who shuts himself up in a stone cell for the rest of his life than towards the clergyman who attends the garden parties of wealthy patrons. At least the monk realizes the power of thought, they will say, and tries by intensive concentration to cure the evils of the world. He may imagine that *his* thoughts were a great deal more powerful than they possibly could be at that stage, but at least he was logical.

It is fashionable to characterize scientists, unless they are practising spiritualists, as hard-bitten atheists without faith. As an actual fact, I think that the technical method of thought produces a greater and finer faith than any blind adherence to idols. In the future, when the vast majority of men will have been scientifically educated, I shall expect to see a greater "faith" than is apparent to-day. It will be

a practical faith, not a creed which preaches love and practises hate; teaches peace and blesses cannon in the name of God.

It is because the rulers of religion have failed to realize the importance of change, that the majority of their followers are only "faithful" on one day out of the seven. The business man goes to church on Sunday, listens to the lessons written two thousand or more years ago, and the sermon based upon their imagery. On Monday, he discovers that some of the things he is instructed to do by his Church would, in ordinary life, prevent his earning a living. If he cannot collect money, he is unable to support wife and children, as he is earnestly exhorted to do by his Church. It seems to him that whichever way he moves he must offend, so he unconsciously relegates his religion to the background and marks it, like the railway timetables, "Sundays Only." Those who have the spiritual welfare of the world to look after will, in the future, realize that they are better occupied in modifying their creeds in the light of modern knowledge than in trying to prove that wherever research conflicts with the written word, research must be wrong.

The churches of the future will have very few followers whose faith is, as a schoolgirl defined it, "Believing something which you know isn't true." To have blind belief in anything and to present a blank wall to all evidence or opinion is not faith but bigotry. The people of the future will have nothing to do with the faith of savages, who worship certain images because their ancestors worshipped them or

because they are told that if they do not obey, terrible punishment will befall them.

They will realize the absurdity of endowing their God with purely human passions. The idea of devils and angels at war will seem essentially human and they will observe that men only spoke of God as loving, hating and so on, because they were ignorant of the wonders of the world. Could a more glaring example of vanity be imagined than that of any man who professes himself familiar with the acts, habits, likes and even the appearance of a god ?

The image of God seems to have varied somewhat of late years. That some directive force seems to underlie the perfections of nature of which we form so small a part, suggests that the faults of the world are faults to our shortsighted eyes alone. Certainly no man who has not had the opportunity of seeing the magnificence of the earth as exemplified in "natural" law, can really appreciate the significance of the word Creator. Is it not more wonderful that matter is created out of energy emitted by the stars than that it is produced from nowhere by some All-powerful God ? All our knowledge shows that matter is not "created" in the sense in which creation is used by many religious people.

Our children's children will realize that all matter and all thought are simply different forms of energy and that "God" as an infinite conception of that energy is far removed from our finite mind. Their brains will be so much more efficient than our own puny organs that they will be able to grasp some real

idea of power. To-day we are little better than savages who must carve idols before concentration is possible. We take the mental exercise a little further and say we will not imagine a being entirely material, but will create God in our thoughts. It seems that man has at all times created God in his own image. A present-day brain is incapable of anything better, so we have gods with human attributes, and servants of gods telling us what God likes and what God does not like. Surely, even *we* can realize that the Almighty is above such pettiness?

In course of time, church services as held to-day will probably disappear, as the people of the future realize that there is little beauty in the human interpretation of present-day religion, and their minds will be far too powerful to be influenced by appeal to the emotions. At present, we are so weak that we need these external aids, but with reasonable progress the necessity for them will disappear.

The history of every notable religion will be taught to all children as a preventative against religious mania. No man or even woman who has read of the world's gods with an open mind would wish to "convert" others whose faith, although different from his own, may be equally strong. Nor would the logical mind burn "heretics" at the stake. It is true that, in England, we have given up this barbarous habit as far as material fire is concerned, but many people are still destroyed in the psychological sense, and to a modern man or woman this, probably, is a far more painful process. Men have been publicly excluded from chapels because they bought sweep-

stake tickets, and others socially ostracized for failing to attend church.

Our children's children will not believe that every person who does not repeat the same prayers as themselves is doomed to everlasting burning in some hell, the exact geography of which is known only to a select few. Nor will they believe in a heaven with harps and trumpets. They will realize that these instruments were selected for "heaven" only because they were the best known at the time of writing. They will appreciate that the apostles, had they lived in modern times, would have introduced saxophones to paradise, because these were in their minds. All writing is necessarily limited to the mentality of the writer, and I am sure that, were those responsible for the Old Testament to live again, they would be amazed at the interpretation put upon their comparatively simple words. A similar case is that of Shakespeare. Great poet as he was, Shakespeare probably did not devote one half the time to thinking out his plays that writers since his death have given to their interpretation, and he would surely laugh loudly at the thought of any serious man writing a book to prove that Hamlet was, or was not, mad; with an examination of the "medical evidence" from the play.

The sermons of the future might usefully have as texts the latest scientific discoveries. The "preacher," instead of speaking of the miserableness of Man and his wickedness, will explain how some newly-found law fits in exactly with all the other regulations of nature. He will not say: "This contradicts some

statement made by a Hebrew or Arab prophet two thousand years ago, and must therefore be untrue," but will endeavour to show the reason and purpose of nature in a world where everything from a filter-passing virus to an ocean serves its exact purpose; perfectly balanced and harmonious, were we able to see beyond our dwindling noses. He will show that the finest life can only be achieved by using knowledge gained and not by deciding upon a way of life and then struggling against realities. There is much to be learned of God's ultimate purpose by a study of the Periodic tables.

I do not suggest for one moment that books like the Bible or the Koran will be relegated to the wastepaper-basket. But they will be read in their true perspective, and those in authority will never be backward in explaining them in reference to the times in which they were written. It will be pointed out that every great "prophet" has admitted his limitations, that Mohammed and Christ both explained that other times would come and produce other problems, which would have to be solved by other wise men. They will point out that it is ridiculous to suppose that religion cannot change, or that it would be as sensible to learn medicine and surgery from Aristotle as to evolve a perfect and detailed way of life from the Book of Exodus.

The people of the future will not fear death to the same extent as have men and women for thousands of years. As Bacon, who was an experimental scientist, has pointed out, it is the fear of ignorance, just as a child fears the darkness.

Modern children are not so afraid, and we are beginning to discover that change is a perfectly natural process, in many cases less painful than living or being born.

Religions, as distinct from religion, will probably be more numerous a hundred years hence than now. Many earnest people pray for "unity," by which I regret to say, they usually mean that others shall be led into their way of thinking. Our children's children will have an infinite variety of religions. The Rationalists will not believe that the Christians are ignorant, or the Muslims that only the "faithful" will enter paradise . . . that weird preparatory state which is so helpful to human theory.

The tendency will be towards more, rather than fewer, religious sects, but this will not mean dissension and disunity. Humanity will soon understand the true meaning of unity, which does not mean a thousand people repeating the same creed simultaneously, parrot fashion; but a thousand seeking the same goal in utter sympathy. They will look at nature and find perfect unity where to the superficial observer there is chaos. If God were as foolish as man in his orthodox Church, he would have created every bird of the same size and colour, he would have made only one flower, one smell, one sound. The world would have been less beautiful, just as we are now retarded by striving for a unity which really means uniformity and is scientifically unattainable.

The history of religions, if it teaches nothing else, shows that each belief is largely a matter of brain development, geography, and other material in-

fluences. The "priests" of the future will have many brands of "faith." They will not try to cram the same ideas down the throat of the Chinese as they do down that of the English profiteer. Missionaries, in our sense, will long since have disappeared. They probably would not survive to-day, but for the unselfish medical and social work of some of their numbers. In the future it will be realized how unfair it is to expect a man to believe in certain facts because he wishes to have the benefit of surgical help, just as it is wrong to insist upon the singing of a hymn in order that a hard bed and coarse breakfast may be earned. Many prefer the rigours of a night on the Embankment to a bed dispensed with prayers in which they cannot bring themselves to trust.

Religious people to-day do not realize that we are entering upon one of the most difficult periods of the world, from the aspect of morals. They would spend less time discussing the exact meaning of certain biblical passages or in debating the ethics of gambling if they realized the importance of certain problems which have resulted from scientific progress. But the modern Nero fiddles while Rome burns and does not grasp that the Church is a bad insurance risk. Our ancestors did the same and so we have slums, prostitution, and the other evils of civilization. We call them "necessary evils" because we are too lazy or too indifferent to solve our grandfathers' problems. Our children's children will be more intelligent, far more ruthless; but they will have less time to spare in finding the remedy.

As yet, many of these advanced difficulties are quite indefinite. One which is beginning to appear is that concerned with gland grafting. The attitude of religious people is one of horror. "Gland grafting," they say, "is immoral," and there is an end of it. It is immoral because it is unnatural, though no one has proved that it is more unnatural than taking ten grains of aspirin, laying drains or washing your neck. The problem which our children will have to face is this. Here is an operation which can add twenty years to a man's life. Certain discoveries regarding blood grouping have made the operation more lasting in its effects. How are we to control a traffic in human spare parts?

The attitude of "religious" people is: "Do not permit this scandal. Put any surgeon who performs such an operation in prison." This negative ruling is both childish and harmful. No amount of imprisonment will hold back the man and the skilful surgeon from co-operation. Prohibition of any kind has always failed. There would be a "rum row" off the Straits of Dover, where surgeons would perform their operations in luxurious liners, or in secret surgeries in cellars. Obviously, the benefits of gland grafting would be enjoyed only by the wealthy, and it is not *always* the rich man we wish to keep alive!

It is ridiculous to suggest that to prolong the life of some skilful research worker, a great writer or even an engineer, could not be advantageous to man. In the distant past, when knowledge was handed on by word of mouth, very little progress

was made. When printing was invented, men could write down some of their knowledge, but others had to come afterwards and read it, before they themselves could launch their voyage of discovery. Year by year, it will become more difficult to acquire even the smallest fraction of the knowledge available. To-day, a man reaches his best period from the mental point of view at forty and enjoys it for twenty years or more. In the future, this age of knowledge may be raised to fifty, leaving only ten years. To add another thirty years to this period, again, would be a great boon. Progress would become faster. There would be less time wasted in the covering of known ground.

The right to have an operation on the glands will be a reward offered by the State to those who have served man well. The wealthy debauchee, unless he patronizes the "rum row," will be allowed to die in mental and physical decay, but the brilliant scientist, musician or mathematician, will be given a lease of new life with varying treatments to suit individual tendencies. As more glands become available, the operation will be commoner and probably eventually extended to all who reach the age of sixty; for the wasters and morons will have been effectively dealt with long before. Man will live for more than an average of ninety years, which is not "unnatural," but natural, because most other animals live for seven times the period which they take to reach the adult stage. Seven times fourteen is ninety-eight. At some time, many thousands of years back, man seems to have lost twenty years of his life, so that his normal

span became seventy years. The fact that many people survive to a much later age without greatly impaired faculties proves that it is not necessary to die of old age at seventy, any more than to perish of measles at seven. It only needs the development of surgery to ensure that a human brain shall be remade and electrically nourished to a bodiless existence lasting many hundreds of years.

So far, the attitude of Britain to the rejuvenation problem has been shown only by a simple ban. We do not even allow research. It is a moral question to which the Church must, sooner or later, give its attention. Uncontrolled gland grafting might have hideous results which would make the unsubstantiated claims of the earliest black magicians pale into insignificance.

The problem does not even end here. If we can graft glands, the surgeon of the future will learn to graft other organs. Skin has been grafted from one man to another. Blood can be transfused. What but the lack of certain simple knowledge prevents the grafting of livers, stomachs, even hearts and brains? A Russian doctor claims to have constructed an artificial heart which will perform its normal functions while the real organ is under operation. Why should it not be exchanged? A healthy heart could be changed for one diseased, a "hobnailed" liver for a sound new set. There would be no lack of people willing to offer anything for money. A Chinese criminal condemned to die finds no difficulty in purchasing a substitute. Mother love is sufficiently strong to make a woman sacrifice her

health and even her life that her children may be fed.

Traffic in human spare parts will have to be controlled. Every new discovery causes some similar problem. The possibility of driving at 60 m.p.h. along a road has given rise to a similar trouble. The discovery of how "life" can be made from seemingly inanimate matter will present another. There may even arise the danger of one man securing his fine weather at the expense of death to another.

If the new religions which are evolved are founded upon a scientific basis, they will point the way to settle these problems. Mere laws will never succeed, just as they have not put an end to the oldest trade in the world. The new religion will have nothing to do with "miracles," or perhaps, it will recognize far more miracles and appreciate them better because men will understand how they are accomplished. The spider weaving its web performs a "miracle," but we do not suggest that it offends the laws of nature and must therefore be "divine." The Church should be more interested in natural laws than in their neglect. No sane God could take a delight in the breaking of laws he had himself made. The idea is so deliciously human, so like a naughty child, that to associate it with an Almighty is almost blasphemous.

Our children's children will think and believe very differently from ourselves, for they will be better mentally developed than the men of A.D. 2000. They will not need symbols to turn their minds to religion or make the mistake of worshipping the statue and

forgetting the model. They will realize that no man need wait until death for a taste of hell, that dressing up pleases 'God' no more now than it did when Christ, Confucius and Mohammed proclaimed its folly. The Church will have ceased to persecute those who seek to explain life and will have realized that every real truth ever taught can be proved by reference to nature far more effectively than by the quotation of "inspired" writings.

Above all, there will be no religious quacks or humbugs. There will be no men who shout from the housetops that it is wicked to work on Sundays and that the first day of the week should be a day of rest, and then go home, on Sunday, to warm their feet by a gas fire, read books by electric light, and eat three hearty meals cooked by someone else. Any unwashed Yogi from the East who has not spoken for twenty years will be unable to draw gaping crowds. A scientifically-trained public will laugh at men who pretend to have power to transcend nature and take silver collections at their meetings. They will realize that truth is more likely to come from a laboratory than from the mouth of a man who attracts attention by his eccentric garb and a neglect of the opportunities offered by the safety razor.

The most ardent supporter of any of the numerous churches to-day could not deny that changes must take place if religious principles are to progress. Large numbers of men and women profess Christianity in some specific form, on account of its social necessity or its moral convenience.

To point to the infinite circle of life which by the

proven theory of matter's atomic indestructibility helps us to know that our existence is no exception, seems more likely to cheer the man of the future on his way. He will understand that time need matter no more in death than a dream. He will understand that the striving for goodness which has lifted him, through a process of incredible beauty, from slime to mankind, is not chance. Perhaps, he will be more satisfied to hope that the modulation of fate by personal thought can be made to last only when love of truth is its mainspring.

CHAPTER XIV

Education in the Future

IN the future, education will have what it has always hitherto lacked—definite purpose. A father tells you he is giving his son the best education he can afford, but if you ask him “ Education for what ? ” he stutters and is often unable to reply. Education, like “ fitness,” is regarded as an end in itself, while no two people can agree on what it means and whether its object should be to fit a man for his life’s work, to stimulate his brain, or merely to give him that dreadful thing called “ tone.” Probably, most fathers hope that their boys will collect something from each department, quite forgetting that heredity has exhausted most possibilities beforehand.

Modern teachers would feel as strangely out of place in the school of the future as would the seventeenth century pedagogue in a present-day council-school. Fathers will not insist upon their children learning subjects simply because *they* learned them themselves, but will realize that the educational needs of young men and women are subject to change, like everything else in the world. Boys are still forced to learn Euclid’s postulate, that a straight line is the shortest distance between two points, although Einstein has shown that it *may* be otherwise. They are

taught Latin and Greek, although there is very small likelihood of their being able to converse with Virgil or Homer.

The schools of to-morrow will not tolerate such folly as plays given in Greek or Latin, as unintelligible to the players as the audience ; dull beyond bearing, were it not for some exceedingly bad puns. The idea of a prize for hexameters will seem as ridiculous as would, no doubt, an award for the best poem in Esperanto to-day. But, whereas these Greek verses are the sheerest waste of time, other than as mental exercise, Esperanto might conceivably be of some benefit. The suggestion that out-of-date subjects should be taught as a method of development is based upon the superstition that nothing can be good for you unless it is dull. Geometry is probably better exercise than Latin, and if real gymnastics are required, why not teach Chinese or Zulu, which are reputed to be the most difficult of all languages ?

Conversational methods taught in the school of the future will be international. I would not like to forecast the success of a new language, but it is possible that a simplification of all speech will enable men and women to learn "Basic French," "Basic English" and so on. This would make it possible for them to talk intelligently with a citizen of any country and to listen to "talkies" made by Eskimos with the same pleasure as those in American. Efforts which are being made to resurrect dead languages are retrogressive, and, like all such steps, must eventually fail. The idea that the Scotch, the Welsh, the English, and the Irish, should all speak different

tongues, if carried to its logical conclusion, would result in a return to the days when the man from Cornwall could not communicate by word of mouth with his host in London. Language differences are one of the causes of misunderstanding and war. It is an appalling thought that two highly-trained experts from different countries may have to use an interpreter to discuss the state of the weather. The time wasted by scientists in studying papers in a language which they cannot easily understand is terrible.

Another cause of wasted time in schools is learning to write. I do not doubt that the child of the future will learn the alphabet on the typewriter. I cannot see men and women in a scientific age wasting time and temper upon illegible scrawls. There is an idea abroad that the typewriter is bad because it does not show "personality" like handwriting. I think our children's children will decide that personality shown by illegibility is not worth having; and in any case, they will feel that the argument is as foolish as saying that a man shows more personality by walking than by taking a bus. Probably, miniature typewriters of very light alloys will be constructed and carried round in the vest pocket. The typewriter will open like a camera and will be used anywhere. This is no more "mechanical" than using a fountain pen instead of trimming the first fingernail to resemble a pen nib. I should like a typewriter which tells the time at a touch and responds to the thought or spoken word.

Signatures, which are even more illegible, will disappear in favour of a stamp with some special

protecting mark, which can be used on letters or the universal cheques which will replace dirty paper. The value of a signature as a protection against fraud has already largely disappeared, and it has always been a temptation to the forger. Special marks, which could be produced only by a small instrument with a key, would be safer and less wasteful. The logical end of this system will be the disappearance of our foolish system of surnames and Christian names. The busy people of the future will have no time to call each other by name, for the fact that two people may legally have the same title leads both to confusion and libel.

A simple combination of names and letters will probably be adopted, not only for men and women, but for streets and houses. "Laburnum Villa" and "Lilac Road" will disappear in favour of "One Second Road" and so on. The idea that romance or personality is lost is foolish. "Fifth Avenue" sounds as romantic, when you are far enough away, as Pall Mall, upon the pronunciation of which no two people seem to agree, much to the confusion of visitors. Life will be speeded up to seconds and tremendously simplified by the use of numbers for everything, and I believe that when the amount of time wasted upon social inanities is realized, children will be taught at school a number of basic sentences, each of which can be represented by a number.

When the business man of the future meets a client in the street, instead of saying: "Beautiful day, isn't it? But it may rain to-morrow, of course. And how's your wife, and the children?", he will

simply rattle off: "Twenty-one, forty-two," which will be the accepted formula for all these openers. His client will reply: "Sixty-seven," which means he agrees with everything, and then they will be able to get down to facts or lies. Just imagine what an appalling amount of time would be wasted by scientists, or less importantly by mathematicians, if they did not use symbols.

Picture the Chancellor of the Exchequer trying to produce his budget in which every pound was separately written! He would need over eight million words, whereas now he can explain the whole system in a few hundred. Chemical books would have to be five times as long if it were not possible to represent the most complicated substances by a simple series of formulæ.

Eventually, of course, children will have, instead of typewriters, a piece of apparatus which will convey speech directly on to paper. The waste of time and energy involved in dictating letters, having them transcribed from shorthand and eventually read over, will irritate the energetic people of the future, and they will use instruments to suit a universal method of phonetic, abbreviated speech or thought, in which a moving sheet of paper is marked by sound or æther waves. Before this is possible we shall require a spelling in keeping with sound and all dialects will have to disappear.

A minimum of time will be spent at schools on subjects which are now considered of vast importance. There was a period when good handwriting was the sure key to a good position, but

intelligent men now realize that printers can produce a better copperplate, that type is less tiring to the eyes, and that the ability to write like a copybook does not indicate any brain beyond that of the imitator. No doubt, monkeys could be effectively trained to work for solicitors and others who still insist upon local colour.

The object of all instruction in schools will be not so much to give the pupil knowledge, but to teach him how to acquire knowledge himself. The amount that anyone can learn at school or even at a University is comparatively infinitesimal. As long as the pupil understands this fact and knows how to continue to acquire information all his life, detail does not matter. The educational system of the future will not produce a race of academic old men who are prejudiced, bigoted, stubborn and incapable of taking a problem, examining the evidence and making a decision which cannot be borrowed from a public library.

There will be no children in the future like the girl who, when asked what seven twelves made, replied eighty-four, but when asked what twelve sevens were, replied that she hadn't learned her "twelve-times table." The mechanical learning by heart of tables, whether they are the dates of the Kings of England, the results of multiplication, or even the atomic weights, will disappear. It is much more important that a child should be able to give a sensible reason *why* two and two make four than to know the formula for solving quadratic equations. "Why" will be the keynote of elementary education, and children will acquire the constructional question-

ing mind, seeking for reasons which are the natural working of laws. At present, teachers give the law first and seldom trouble to explain the reason.

Certain subjects will, of course, be wiped from the curriculum of the best schools, although I do not doubt that a hundred years hence there will still be schools, supposedly select, because they teach subjects which have been abandoned by others.

Among the subjects which will be greatly changed are drawing and divinity, both of which are now given positions of absurd importance. Many children waste hours "lining in" so-called freehand drawings. It is probable that photography or some other method of reproduction will be taught alternatively. The mental stimulation will be the same, the benefit to the vast majority of children, who have no talent or even interest in drawing, will be far greater, and the number of technically deficient photographs taken every year will be usefully reduced.

"Religious knowledge" is at present a mere matter of learning by heart, a not particularly useful accomplishment. To be able to repeat the Kings of Israel in order or to give the names of the tribes and plagues of Egypt does not help a child to lead a better life. The people of the future will realize that, in all probability, the Kings of Israel did not play nearly such an important part in the growth of civilization as did the Chiefs of Mexico or the poets of China. Religion, in so far as it is taught at all—it is not a subject that can be "taught"—will probably be based on comparative studies, and children will not learn that everyone who does not believe the things

he or she is told is a "heathen." An understanding of the basis of dogmatic religions will go far to eliminate the terrifying doubts that beset a child when it grows to manhood. Present methods produce on the one hand a group of atheists, the most foolish of all men, who boast that they believe in nothing; and on the other, a band of fanatics and bigots, who seem to derive comfort from the repetition of formulæ which have long since lost all meaning. It is not hard to imagine a child of the future, educated on scientific lines, patiently calculating the acceleration with which Satan fell from Heaven ($g=32$!) or wondering how it was mathematically possible for David to magnify a Lord who was already infinitely great.

History is another subject which will be taught on completely different lines. The Kings of England and the wives of Henry VIII will lose favour and children will be shown how to study world movements rather than the birth and death of kings, many of whom made but little more difference to the world than the least of their subjects. History as taught to-day is full of the grossest absurdities, many of which have been the delight of the satirist. Some children who know the names of kings from 1066 to the present day, cannot tell you anything about Europe between the first and tenth centuries, while the history of such commercial countries as Persia, China, and Mexico are closed books. H. G. Wells is, perhaps, the only modern writer who has attempted to re-adjust the false values given in history. Others, in later years, will appreciate the incalculable benefit of his work.

We have been so surrounded with prejudice and tradition in the matter of history that it is difficult even for the scientifically trained to wade through the welter of wars, births, deaths and laws and see something approximating to the truth. To take one single instance, we were all taught at school that the Magna Charta was a stroke for freedom. We were never given the document to read or we should have discovered that it was nothing of the kind. It was no more than a gentleman's agreement between a king and a number of his barons, who for the moment held the whip hand, in which they agreed upon a method of dividing the booty they were likely to receive !

There are probably three dates which every child carries from history lessons into later life—1066, 1215, and 1815. But how many men could give you, even approximately, the year when printing was invented, an event which has had far greater effect on civilization than any conquest, charta or battle ? If we must have dates, it would be better to remember those of really important affairs ; like Harvey's discovery of the circulation of the blood, or Priestley's isolation of oxygen.

History will be taught purely from the point of view of the future. Those who studied the history of the eighteenth and nineteenth centuries should have had no difficulty in forecasting the Great War. A number of distinguished soldiers and sailors did, I believe, write a book about 1894 entitled " The War of 19— ? " in which the Great War, its causes and results were forecast with remarkable accuracy. But

it is not sufficient for a few experts to do this forecasting. Such prophecies must be understood by every man and woman, so that the consequences of false action can be avoided. If we cannot learn lessons from history and build the future accordingly, we shall learn from nothing. Yet the statesmen who signed the Treaty of Versailles showed that they had discovered nothing and forgotten little. Congress Danced in 1814 and its modern equivalent did much the same in 1918. A hundred and four years had taught nothing.

The questions in the history examination paper of the future will not be "Trace the events leading up to the Battle of Waterloo," but "Trace the changes in transport during the *next* hundred years"! A study of the past is a waste of time unless it teaches something for the future. For the man whose mind has been trained in scientific principles, it should be little more difficult to trace the progress tendencies of transport during the next hundred years than to write a history of it since 1835. Curves can be plotted for other "commodities" than money.

I have mentioned an examination paper, although progressive educational experts may argue that there will be no examination papers in the future. No substitute for this form of test has yet been found, and the system will probably be with us for many years yet. The people of the future will find, however, that the drawbacks of the examination lie not in the method but from the inferences drawn from its results. The boy who takes highest marks in an examination paper in mathematics may not have

the makings of an astronomer. The examination merely shows that he can perform certain set tasks efficiently, and he may make a far better office boy than an astro-physicist. The boy who fails completely, on the other hand, may show great originality of thought and ability to think for himself. He will not write down figures mechanically unless he understands their meaning. He may have the makings of a scientist. Perhaps, in examinations of the future, the boy at the bottom will get the prize!

Certainly, entrance to the professions will not be governed by examination as it is to-day. A certain basic elementary knowledge may be required, but after that has been ascertained by these means, vocational tests of all types will be applied. Present-day intelligence and vocational tests are unscientific and sometimes ludicrous. But a system may be developed for discovering whether a boy has the equipment of the embryo accountant or doctor. Written tests may be still more dangerous in an era of pocket radio.

The problem of suitability is often spoken of as "avoiding the square peg in the round hole," but the educationalists of the future may find solution by another method. They may not worry much about a boy's so-called natural tendencies and gifts, realizing that to crawl on hands and knees may be a natural tendency, as well as to eat with one's mouth open. They will say, "During the next three years, the Statistical Bureau assures us that ten thousand accountants will be required. We must take ten thousand suitable boys, and by correct

diet, environment and courses of suggestion, make them good and happy accountants." It is a question of which you are going to change, the square peg, or the round hole; and because the "round hole," that is, the number of persons required, cannot be altered, it must be the peg, the young men and women, that will be made to suit. As I have already suggested, the system will eventually be carried further, and the boys of certain parents singled out for a particular type of work, because of hereditary influences.

Private boarding schools, which are often no more than convenient institutions for lazy parents who will not, or cannot, manage their own offspring for more than three months in the year, will disappear. There will be a number of state boarding schools in which children who have been taken from incompetent parents will be placed. These schools will probably make a handsome profit for the government, for a parent who is incompetent will be much more highly taxed than a bachelor who merely refuses to contribute his share to racial progress. School teachers will be amongst the highest-paid people in the land, as it will be recognized that only the highest type of intellect is capable of successfully managing the future generation. It takes more ability to be a successful school teacher than a successful Prime Minister.

Punishments at schools will be restricted to confinement in the sanatorium. The master of the future, instead of birching the boy who misbehaves, will recognize that his glands are working defectively, or that he has a touch of indigestion, and will send

him to hospital for appropriate treatment. School-boys will probably read of "lines" and beatings with much the same feelings as we read of the pillory and the stocks. The idea that inflicting pain "makes a man" of a schoolboy originates in several ways. With some men it is often desire to take unconscious revenge for various floggings received in boyhood. With others it varies from slight atavism to downright sadism. Inflicting pain on others will be so repulsive to the men of the future that the old joke about "it hurts me more than it does you" will become true.

The "school age" will slowly rise, until a man is not expected to be competent to enter a profession until he is thirty. Men will be living longer, so that their period of useful work will be the same.

I shall expect to see vast changes in all educational principles, for I believe that we teach, to-day, on lines more suited to savagery than those of mental advancement. No one has adequately investigated as yet the possibilities of pre-natal treatment, the regions of heredity in which some children are pre-disposed beyond hope to one form of learning alone, or the uses of surgery and medicine for encouraging young people for specific duties. I see no reason to doubt that in a few hundred years' time, we shall look upon the seemingly pampered children of this age with a mixture of pity and horror. We do it now when looking backwards. What darlings they will be in the future with their "nerves," thin skulls, bald heads, "glasses" and false teeth at the much injected, irradiated age of seven!

CHAPTER XV

Clothes and Food

CLOTHING and food are considered to be two essentials of life. To women, perhaps, clothes seem even more important than food, and many a city typist goes without her proper lunch in order that her legs may be covered in silk stockings or her head by the latest "creation" from Paris. It is a useful exposé of a woman's mentality to know that next year's fashion is the most absorbing topic of conversation, but the scientist is far more concerned with the fashions of six hundred years hence rather than the eccentricities of the next twelve months.

Clothes were originally worn to obtain warmth or as protection from the weather, and it is quite possible that in the future they may return to this use. For many years they have been worn primarily to attract the opposite sex, to conceal the fact that women have too short legs, and to add seeming dignity to a ridiculous figure. In the future, the fine feathers in a woman's hat will be recognized for what they are, a sexual bait, and she will be placed in the same evolutionary class as the bird from which the feathers were plucked. It will be recognized that there is no biological difference between the coxcomb of the barndoor cock and the brilliant tie of the dandy.

Creators of fashions will have disappeared, for there will be only one fashion. Clothes will be designed, not for the sake of appearance, but for utility. Such new designs as exist will be devoted to better fastenings, ease of ventilation, ray permeability and heat absorption from radiators or electrical transmitters in the streets. The weakness of human nature which makes it possible for a small group of men and women suddenly to declare that fashions have changed will be eliminated by education. Women will realize that using clothes as a lure places them in the same class as the lowest animals and that their cleverness is not so cunning as that of flowers who employ so many devices to capture the bee.

Weather may be to a certain degree under control, and this will make it all the more necessary to standardize clothing in the interests of economy. It would not do to have a sitting room with a mechanically-controlled constant temperature for a man wearing a fur coat, while his wife was clad in the flimsiest silk. Present-day clothes have not even the advantage of being weatherproof. Men's clothing is irritating on hot days and insanitary when cold. A few drops of rain reduce a boiled shirt to its elementary starch and cellulose. Even on warm days, clothing merely keeps out the valuable ultra-violet rays of the sun, so that doctors can make fortunes by treating their patients with the synthetically-produced variety.

Chemists in the near future will employ some method of making ordinary clothes transparent to ultra-violet rays. It has been found possible to

produce a glass which allows these rays to pass, and the task of making cloth with similar qualities should not prove impossible. Other rays from the sun may be found equally desirable, and cloths could then be designed in accordance with the latest discoveries of science, rather than the puerile dictates of fashion.

Men and women will have been educated out of the idea that clothes are an aid to eating. They will realize that the food and wine which can be appreciated only when eaten by a diner in a dress shirt or a gown cut down to the waist, is unnecessary. Dining in public will probably be considered impolite, just as for some years the performance of certain other natural functions has been carried out behind locked doors. To enjoy good food is merely to remind yourself that you are still an animal.

The object of dress designers will be to produce the simplest possible garment, easily sterilized, and easily put on or off. Men and women will not be content to waste two or three hours a day fitting together a collection of bits of cloth and bone over their bodies. If the time at present devoted to dressing and undressing were given to more useful occupations, there would be less poverty in the world.

The man who boasts that his time is worth a guinea an hour spends seven hundred and thirty pounds a year in dressing, a sum probably greater than that which he contributes to the State in recognition of its beneficence in allowing him to remain alive.

The simple, one-piece suit of the future will have no tapes, buttons or frills. It will be fastened by

pulling a small piece of leather, and possibly enclosed at wrists and ankles to keep out the dirt. It will be loosely fitting, for it will be bad manners to remind your neighbours of the shape of your body ; also because it will be more generally recognized that air is the warmest vest by virtue of its poor conductivity. Clothes are not worn to *make* the body warm, but to keep the body warm. The heat which escapes from the body has to be replaced by food ; digestion absorbs energy and we shall aim at wasting as little as possible.

Wearing the same suit on two consecutive days, without sterilization, will be considered worse than sitting down to table without washing the hands. Probably, the parents of the future will show their children a pair of stockings, a pair of shoes and a man's coat from the twentieth century, under the microscope. They will see all these articles swarming with bacteria, and looking far dirtier than a dustbin. They will wonder at the ignorance of men who thought nothing of wearing a heavy serge suit for months on end and the coarseness of women who placed on their feet articles which would have been more fitted for the destructor.

It is unnecessary to point out that the ruination of stomach muscles by high-heeled shoes will be discontinued. Modern woman commonly rejoices in a bunch of horny, distorted toes, but her future sisters may well treat these oddments as ornamental luxuries.

A sterilizer will take the place of a dirty clothes basket and the suit placed inside it at night time will

be delivered, guaranteed free from bacteria and dirt, by the next morning.

Less progress has been made in the matter of clothes than in any of the other necessities of life ; indeed, I am not sure that the last few centuries have not shown a temporarily retrogressive tendency. Our ancestors at least wore clothes which were easily washed. When they wore furs, it was definitely for warmth, but to-day women who have expensive furs will produce them in the summer in order to catch the eye. Even furs will gradually lose their value now that synthetic materials so closely resembling them are being made as the result of chemical research. The very wealthy will then have to seek out some other form of adornment to distinguish themselves. If the present tendencies continue, they may wear ivory rings in their noses, at least until such time as the chemist discovers how to make synthetic ivory and it becomes available to everyone. Clothes are still useful. Our minds are growing and we cannot logically be naked any more than we can develop our thought while we chase a rabbit for food.

Universal wireless and television will do much to make fashion a thing of the past. When people from London see the advantages of being dressed in the simple garments worn by South Sea Islanders, they will probably decide to find husbands or wives by beautifying their minds rather than their bodies. Being " in the fashion " has meant, in reality, wearing something different from the majority. As soon as a fashion becomes universal, it is discarded in favour of something else. When it will be possible to flash

the latest eccentricity of Paris to the remotest village of Greenland in less than a second, and chemists are ready with synthetic materials to copy anything within two days, "fashions" will cease to exist.

Umbrellas will probably disappear. In an age when everyone wears spectacles, the danger of umbrellas in crowded places will lead to their being classed as dangerous weapons! Increasing baldness will demand some close-fitting headwear to protect against wind, sun and rain. This headgear may be electrically warmed, and it is even possible that in very cold climates all clothing will be wired for heating by electricity. A small storage battery will be carried in the pocket, or an aerial sewn into the lining, and the current received by wireless. It may be necessary to incorporate noise-absorbing material in the headwear. Cotton wool stuffed in the ears is no protection against noise, for vibrations can be received by the bones of the head and body. When arcade streets prevent the need for warm clothes, or when we live underground rather than face the rigours of climate, apparel and morals will be discarded.

The ridiculous idea of "raising hats" to women will fall into disuse. Women wish to become the equals of men. This object may take twenty million years or may lead to the merging of the sexes to one egg-laying incubated generation, but it will no longer be necessary for men to show respect to competitors by indulging in primitive symbolism. Further, the risk of catching cold will be too great to risk the sudden exposure of such a large skin area.

Once commonsense clothing becomes universal,

few major changes will occur. As new discoveries reveal new and desirable qualities, fresh clothes may be manufactured, but as the cloth of the future will be almost indestructible—possibly made of an as yet unknown alloy—the millions of hours now wasted every year by staring in shop windows, making clothes and wearing them out, will, probably, all be turned to knowledgeable purpose.

Antiquarians, if there are any, will be the only people interested in clothing, and they may unearth pieces of feathers, leather, and ribbon, with great pride. It is quite possible that in dressing some of the models for their museums they will place the skirts on the men and the trousers on the women, pointing out, quite logically, that women, who hovered round stoves and brooms, would need clothing adapted for hard work, while the men who spent their time at desks would prefer the coolness of skirts. In the day of standardized clothing, it will not be unusual, perhaps, for a husband getting up in the morning to be unable to tell which suit is his own and which belongs to his wife.

Uniforms as we understand them will not be used. The soldier of the future will not need bearskins, brass buttons and red tabs to suggest fierceness. Even in the Great War it was discovered that the rage suggested by brass buttons was of not much avail against a bullet and that bright surfaces were an excellent target for the sniper. Men will no longer be intimidated by a mere show of force, realizing that one finger on a switchboard is as good as another and that mind can be made more dangerous than matter.

It is now some time since naval officers grasped that pigtails were not an advantage, but they have not had the courage to suggest the abolition of the collars designed to keep grease from pigtails from the clothes. Sailors do not to-day require to roll up their trousers as frequently as formerly, but they still wear them of ridiculous width and run great risks in the modern fighting machine, where cogs and engines abound. The sailor in spectacles will not seem ridiculous in the future, indeed, spectacles will be considered superior to two-foot telescopes.

The idea of uniform originated in the days of mercenary armies and was instituted to enable one side to pick out the other in a hand to hand fight and to encourage discipline above the logic of fear. Bright colours, blaring trumpets and waving flags also give false courage, but experience has shown that the soldier stripped to the waist and covered in mud may prove more efficient than his colleague in a hat two feet high. It is only their mentality which has saved scientists from dressing in scarlet every time they work in their laboratories. Indeed, it is not so long since no experiment was believed possible unless the experimenter wore the correct clothing. The uniform of certain other classes is designed merely to give false importance or a sense of slavery. The musician's long hair and high collar are supposed to cover his deficiencies, and the servant's cap and apron to remind her of her inferior position, so that she may not be tempted to flirt with her master!

In the future, men will be judged by what they think and not by what they wear. A smart appearance

may be taken for what it is, vanity or ignorance of the waste involved in decorating the body. The man or woman who is "different" merely for the sake of being so, will not be admired. To-day, the male artist allows his hair to grow and the female cuts hers off. Perhaps, in time, the Ministry of Health will issue a bye-law dealing with the ideal length of hair for men and women who are not bald. But this hair business will doubtless be decided by doctors, who will indicate its insanitary nature and insist upon depillatory treatment at birth.

When men are judged by their personality and thoughts, instead of by top hats and spats, useless and expensive dress will be looked upon as bad taste and unscientific. Top hats will probably be worn instead of the broad arrow by dangerous criminals. Onlookers at weddings will be more interested in what the bride thinks than what she wears. Women must give up matching their man-made complexions to their underclothes or nails if they wish to claim equality.

If the idea of suiting clothing to food continues into the future, dresses will become remarkably brief. I do not think that people will for long be content to spend one quarter of their waking hours at the dinner table nor will the indigestion resulting from over-indulgence in beef steaks and champagne be considered necessary to the discussion of business. The influence of food upon character will be more fully understood. The subject has not seriously been studied, but Kean the famous actor used to choose the dinner he ate according to the character he was going to play. He chose pork for a tyrant, beef for

a murderer and mutton for a lover. His dietary suggested that the effect of meat produced varying degrees of insanity according to its nature. It has been possible to give a Hindu certain Japanese characteristics by varying his diet, and it may be discovered that what are generally called national features are only the result of selective feeding. Universal peace may be achieved by chefs.

The importance of chemicals consumed in very minute quantities will be investigated. It may be that the traditional cruet of mustard, pepper and salt will disappear in favour of other chemicals. It has been stated that a small quantity of magnesium chloride in place of sodium chloride will eliminate cancer, but on the other hand, if men and women in the future eat all the things supposed to prevent cancer, they will rarely rise from the dinner table, and if they abstain from those supposed to cause it, they will surely starve.

The quantities of food consumed will be greatly cut down. Men will not eat more than the minimum required to keep mind and body active. That this minimum is much less than is now generally eaten is proved by the fact that prisons are the healthiest hotels in the country. A few hundred years ago, it was usual to eat until you could not move. This habit grew up in the days when life was uncertain and food supplies unsecured. The hunter who killed after several days' starvation, ate all that he could, being uncertain when he would eat again. To-day, this is unnecessary, and would prevent all hope of mental development. Unfortunately, perhaps, the

human stomach has for hundreds of generations become accustomed to receiving masses of food, and until the excision of the stomach becomes as common an operation as vaccination, this desire for bulk must be satisfied. No doubt, the restaurants of the future will supply a quantity of food, admittedly without value, but simply to provide bulk, while the really vital foods are taken in capsule form. Busy people will not want to waste hours sitting at a table while one course is cleared away and another produced. In a few thousand years, food may be taken only as tabloids by the hairless horror called a beautiful man-woman. A large head and brain, buttons to push instead of limbs, no teeth or nails. Once a week she will have a meal of some heavy cleansing material, not for nourishment like the snake-men of to-day, but to work the dwindling stomach, assisted by electrical massage or light rays at night. Education may be also injected, and eventually we shall be able to have the greater part of our intestines removed with the appendix, at birth. These tabloid meals will be conveniently carried in a small pocket and eaten without the necessity of stopping work.

Chemists will seek the perfect drug for everyday consumption. At present, we have only three, alcohol, caffeine, and nicotine, and all of them have dangers. Alcohol will undoubtedly be universally prohibited in the future, not because it is dangerous to many, but because it is dangerous to the few. It will be prohibited on the same grounds that revolvers are forbidden without a licence. Guns may be useful weapons on certain occasions, but the danger of their

falling into the hands of the mentally unbalanced is so great that a licence is necessary before they can be legally obtained. Alcohol presents similar dangers and will be permitted only to those for whom it may be considered necessary. Education will result in the "drunken man" being abolished from the music hall, for it is a strange thing that, while being sick as the result of over-eating is considered indecent, walking about with a red nose resulting from excessive drink is considered almost as excruciatingly funny as unfaithfulness. It is a remnant of a day when no person could ever obtain sufficient to eat or to drink.

The new drug will, perhaps, have the effect of enabling men to remain awake for very long periods without fatigue or evil after-effects. Such a compound was, indeed, tested by German miners during the War and they found that twelve hours at a stretch could be worked with ease. No bad after-effects were observed over a period of twelve months, but such an experiment is incomplete and for obvious reasons I will not reveal the name of the chemical employed.

Any stimulants taken by the people of the future will not have the effect of numbing the brain and giving it a false sense of values. Rather, these stimulants will be taken to render the senses more acute. For example, the skilled mechanic may absorb something which makes his eyes and brain work ten times as fast. A piece of machinery moving at prodigious speed would then seem to slow up and he would be able to make a careful examination. Again, the painter might swallow something to stimulate his colour sense, although, in this case,

there is the difficulty that a packet of the same powder would have to be given away with every reproduction of his picture !

The border line between food and drugs is very difficult to discover. Drugs which affect the brain may automatically fall out of use owing to the necessity for speeding up. The motor car has done more to sober men than any number of Temperance Leagues. A normal man driving a motor car knows that he must have complete control of himself, and realizes that alcohol, even in small quantities, has an adverse effect. Therefore, he does not drink. The tragic accidents resulting from men suffering from alcohol driving motor cars are the exception, and while no form of punishment seems too strong for them, the fact remains that science has succeeded in making the world, as a whole, more sober ; where politicians and clergymen for centuries have failed. Many accidents occur because we have not yet fully accustomed ourselves to the process of perpetual speeding up. The skilled worker of the future will have too much pride in his power of control to endanger it by taking harmful drugs. But not all drugs are harmful ; it is possible to poison yourself with tobacco, but it is also possible to poison yourself with bread if you eat enough. In the future, it will probably be illegal to sell cigarettes from which harmful compounds such as tar and piridine have not been removed by a special mouthpiece.

The world has been content with a very limited number of stimulants for a long time. I have no doubt that, one day, men and women will be able

to choose between a wide series of variations of the eternal tea, coffee and cigarettes. There might be a product to suit every need, and when individual stimulants are prepared after a most careful examination of blood and internal secretions, excessive indulgence may become the most serious crime in the calendar.

Although the connection between clothes and food is not in the ascendancy at the moment, there is an undoubted tendency to occupy an increasing number of senses when appealing to bodily passion. One dances in coloured light to sweet smells, and I am sure that colours, food, or advanced digestive rhythm will be chemically, even psychologically combined in the successful restaurant of the future.

Finally, to appreciate such a performance will call for clothing to match, materials upon which colours can be projected by the proprietors, and other adornments for those who are so savage as to waste time. But mental stimulation will be hastened by the frenzied attempts of half-sexed creatures to discover some new place where clothes need not be worn. Beauty can be demonstrated in many ways when its locality is enlarged by travel, and women have never failed to establish throughout the ages that consequences do not interest them in the least. I am just wondering what mystery they will invent next ; it will have to be something really good to replace a skirt.

CHAPTER XVI

The Supernatural

EVERY year the field of the supernatural, supernatural, or occult, has been growing at once smaller and larger. It has been getting smaller in the superstitious sense and far larger in scientific importance. The more we know, the more we realize the vastness of the unknown, but at the same time, a certain number of happenings once considered "occult" become more standardized and capable of technical study. Ultimately, of course, if we believe in a perfect plan for the universe, there will be nothing "occult," but exactly when that will be, has not yet left the realms of theology or the theatre.

The object of the scientist of the future will be to eliminate the occult. In the immediate future it is the superstitious faculty upon which he will concentrate. The nature of the atom is still occult in the sense that it is not exactly known. Atmosphericics received on the wireless come under the same category, for we do not definitely know either their nature or their cause. This "occultism" is in the field of science, and time will eventually make all things plain. We do not speak of these things as "supernatural," because the scientist tries not to be superstitious or to ascribe unexplained happenings to

some hidden power more powerful than man. Supernormal, perhaps. Our present-day knowledge does not vastly exceed that of a dog.

Many of the subjects now considered occult will fall beneath the influence of the scientist in the near future. Alchemy has changed from a study carried out with the aid of prayers in semi-darkness to a serious study made in well-aired laboratories; the results of experiments being open to scrutiny by anyone. Herbalism, which fell into disrepute because of the foolish superstitions bound up with it, has been revived under a scientific ægis. There is nothing mysterious about the healing effects of plants, and the modern herbalist will tell you the names and chemical constituents of the drugs they contain. He will not tell you that the remedies are only effective if taken at midnight with a cat's whisker or on a moor with a tiger's tooth hung round your neck.

Which are the so-called supernatural studies of to-day which will become sciences in the future? That which first springs to mind is spiritualism, because of its tremendous importance. The next generation will realize that if there is anything at all in spiritualism, it is the most important study known to man, and that chemistry, physics or engineering are of comparatively minor value. They will, when this is realized, immediately demand a technical investigation under circumstances far more rigorous than has yet been possible.

Unless spiritualists change very much in the next twenty years, they will find themselves up against the same barriers of superstition which have faced

all unbiased investigators in the past. They are told that investigations can only be carried out by dim red light, in the presence of sympathetic people, and that one person out of sympathy may prevent any phenomena occurring. All this is quite possible upon occasions, but it cannot always be true unless animism is assumed to be the true explanation of all phenomena and we agree that the projection of thought forms has a material base. They will, perhaps, wonder at the obvious contradiction of these prior statements. On the one hand, it is suggested that experiments must be carried out by red light, which is "darker" than white light—a purely material idea, since it is sheer chance that our eyes are adjusted to receive impressions on the particular waveband represented by white light. On the other, the "spirits" are affected by thoughts, which may or may not be material. The inevitable conclusion is that as nothing can be in two places at once, not even in this world or the next, anything seen must be an illusion.

With a subject of such major importance it seems desirable that a Royal Commission should be set up to make the necessary investigation. The necessity might easily arise. A thoughtless policeman might arrest a medium for telling fortunes and the judge might ask "What is a medium?" Probably, by reference to a case of 1856 or thereabouts, he will find that a spiritualist is a fortune-teller within the meaning of the Act, and there will be an immediate agitation to amend the law, so that those who see the future in darkened rooms by the aid of mediums

are safe, while those who gaze into a crystal in daylight are liable to imprisonment.

Presuming that the men and women of to-morrow will be more intelligent than those of to-day, they will demand that the Commission be composed of qualified scientists, accustomed to independent research work, and not known to have any superstitious leanings. They must have no prejudice against spiritualism, and, more difficult, they must have no particular desire to speak with the dead. When the thought is father to the deed, true investigation is impossible.

The Commission will really have three main questions to answer. First of all, do the phenomena, such as speaking through trumpets, making wax impressions and ghostly manifestations, actually occur in the physical sense? Secondly, if they occur, how are they caused? Thirdly, is communication with the dead possible, and if so, is it useful?

I am not sure how the Commission will set to work, for they must face the almost insuperable difficulty of defining the truth. It is not easy without instrumentation to decide what is, or is not, seen. It is very hard to prevent desire controlling opinion, and if thought be electrical in its base, interference is a foregone conclusion. I see no ultimate reason why mental impressions and even matter should not be created by unconscious cerebration. But how is this to be connected with life in other planes or dimensions of time? Observers should attend some hundreds of séances, given by every kind of medium. But as they may be told that they must have sympathy

before they can see anything at all, they will be severely handicapped. Technical men will always accept the simplest or most obvious interpretation of any event, rather than ascribe it to a theory which demands faith, hope, and often charity. They will believe, for example, that rain is merely condensing moisture rather than a mysterious substance showered on the world by a beneficent Being. Knowledge will not prevent them believing in this Being!

Members of this national committee of investigation will probably have experiences very similar to most people, for spiritualism has advanced little in two thousand years; most "phenomena" described to-day are mentioned in very ancient books and seem unlikely to make substantial progress in the next fifty years. Investigators will find that, in very many cases, those who say that they "see their dead loved ones," or "often hear them speaking," genuinely believe that they are accurate. Certainly most are honest. In some cases, the Commission will hear the voices and see the visions; in others they will have the option of believing that they lack the necessary "faith," or that the vision exists only in the brain of the beholder. Our knowledge of the workings of the brain will be more advanced by the time the Commission is appointed, and some scientific definition of existence will be available. At present, it is most difficult to distinguish between a vivid day-dream and what we call "fact." Imagination may be so vivid and so long continued that the beholder believes it to be fact. The rest of the world calls it a delusion and the unfortunate man is put in an

asylum to share his dream with others of the type.

In passing to the second question, the investigators will, of course, concentrate on those mediums who produce phenomena which they themselves can see and hear. Delusions and lunacy will be outside their terms of reference. They will have to consider how these phenomena are caused, and here they will meet with even worse difficulties. Undoubtedly, in many cases, they will detect the clumsiest frauds. When they flash on their infra-red torches in the middle of the séance, they will record that the medium, who was strapped to a chair, was walking round the room with the detachable arms of the chair still tied to his wrists. They will find in the laboratory that the long stream of "ectoplasm" which issues from the medium's mouth in semi-darkness becomes regurgitated cheese cloth. They will discover all sorts of mechanical apparatus for producing mysterious phenomena, but, being scientific men, they will by no means conclude that every medium is a fraud because a large number are found to be clever illusionists. Nor will they consider entirely convincing the evidence and demonstrations of conjurers who offer to duplicate anything done by a medium. It is possible for a sleight of hand expert to produce gold from lead. This does not prove that it cannot be done in the laboratory quite genuinely.

Many of the fraudulent mediums, when detected, will undoubtedly plead—as they have in the past—that it is the first occasion on which they have offended. Always before, their phenomena have been genuine, but on *this* occasion they were so anxious to

convince their audience that they were tempted. On this point the Commission will probably recommend, either that no charge should ever be made for the séance; or that penalties for fraud should be very great and that mediums should be allowed to practise only with an approved licence. In their interim report they will say: "Having regard to the great temptations experienced by mediums, and testified by themselves before us, we recommend that those claiming to be in touch with another world should be allowed to practise only under strict supervision.

"We find that many are influenced throughout their lives by visits to mediums. One witness told us that he had invested all his savings according to the advice of a spiritualist. Subsequently he had lost them, but on threatening to sue the medium for fraud, she had replied that the money would be no use to him in the next world, that she was not conscious of what her control said as she was merely his mouthpiece and that, in any case, he would never face out the publicity involved in a law suit." They may recommend an immediate amendment to the laws relating to libel and slander, so that a medium alleged to be under control shall be deemed fully responsible for her acts. The loophole which so obviously offers great opportunities to the clever criminal is sure to be safeguarded by some means.

It will probably take the Government three or four years to pass the necessary legislation, because members will receive daily postcards threatening the most terrible happenings if they vote for the Bill. The measure will eventually be pushed through as a

result of the case *Smith v. Brown* and another. It will appear that Brown is a medium who, during a trance, uttered a number of gross libels against Smith, who promptly issued a writ against the medium and his manager. The medium's defence will be that she did not know what she was saying and that it was really her control, a Parsee philosopher of the seventeenth century, who uttered the libel. Counsel for the defence will demand that the Parsee be materialized so that he may be cross-examined, and by a process of *reductio ad absurdum*, the case will be laughed out of court, Mr. Smith nevertheless receiving heavy damages. The judge will point out that Brown, if he is not responsible for his actions, must be a lunatic and give him the option of being certified or paying up. Brown, having found mediumship very profitable, will pay. This will immediately bring matters to a head and the law will be amended.

Probably, the Commission will sit for another five years after issuing its first report. Its findings will then be published in two large volumes, but as there will be nothing in these volumes which has not been said before, the public will come to the conclusion, either that the men appointed were incompetent, or that they were not given a fair opportunity.

I honestly believe that the trend of events may be equally absurd. Absurdities are always allowed to continue until revealed. The time must come when people will have to decide : " Is spiritualism genuine and if so, is it worth pursuing, or is it merely a superstition ? " At present, all who should be interested merely shy at the question. The Church

gives no guidance on a subject which should be its own particular province, although I believe it has a special form of service for laying ghosts. The law loses itself in a maze of irrelevancies whenever a spiritualist appears in court. Broadly, the law refuses to listen to any psychic statements whatsoever, a suggestive but apparently neglected fact.

If any phenomena are genuine, how are they to be explained? To this question, I think, our scientific commission will give a number of answers. They will state that they have received no technical proof that séance speeches are those of spirits in another world. They will suggest that occult phenomena are sometimes the result of "seeing across time," just as television enables us to see across space.

They will suggest that in some cases the remarks of the medium are due merely to the subconscious assuming control and producing a vast amount of material which the medium "never knew." They will point out that respectable people under an anæsthetic often emit a babble of oaths and indecencies which, if they were fully conscious, would shock them beyond measure and of which they would protest that they did not even know the meaning. They will quote the case of a charwoman who, under hypnotism, was able to solve arithmetical problems, although when fully conscious she could hardly add five and fifteen. Or another case of a medical student who answered questions in an examination while under admitted hypnotic control.

"There are many plausible and possible explanations of psychic phenomena," the Commission will report,

“and they do not all demand as a postulate that the dead continue to exist in much the same form as upon earth. We found some curious contradictions here. For example, a child appeared at one séance and addressed its mother. But it spoke as a child, it looked a child, and the medium told us that the poor little thing had ‘passed over’ some twenty years previously. If it continued to have any connection whatever with the material, it should have been an adult, and its mother obviously would not have recognized it. This strongly suggests that where the phenomena are not produced by mechanical devices, i.e. deceptively, they are reproductions of events which have occurred in the past. The idea that they are occurring in the present is an illusion, just as the gramophone and the cinema create the illusion that past events are present.”

The answer to the third question depends upon the first two being answered positively. Is spiritualism beneficial? One of the most obvious benefits which communication with the dead should give man is a knowledge of the future. “No evidence of any useful information being conveyed to men and women at séances has been placed before us,” the Commission will report. “Most of the statements made have been singularly dull and unintelligent. The sermons delivered, when intelligible, have been such as might be expected from a man who had read many philosophical or religious books and digested none. It has been explained to us that, as mediums become more practised, they will be able to secure better results, that at present it is sufficient simply to be

in touch with the dead and that in any case a large number of people derive great comfort from these practices." They will go on to point out that as spiritualism postulates the conquest of time, it should be possible to obtain a perfect picture of the future, but that immediately the future becomes known, it is the present, which is absurd. The future cannot be known, although it can be logically deduced. "Bookmakers whom we called upon to give evidence," the Commission will report, "were not very optimistic about the tips given at séances. Men whose living depends upon the movement of prices on the Stock Exchange were unable to show that spiritualism had benefited them." It has even been stated that foresight must not be used for mundane purposes.

Supporters of the creed will no doubt protest at the Commission's decision to take evidence from bookmakers and brokers, but if it were possible to determine exactly which horse would win and exactly what stock would rise on the following day, no one would bother to run horses or buy stocks, so that the whole iniquitous system of betting and gambling could be wiped out at one stroke. Then, indeed, spiritualism would have performed a useful service.

As regards the "comfort" received by some of those who attend séances, the Commission will no doubt point out that much the same sort of comfort can be obtained by the use of alcohol or other drugs, and that there is the inevitable danger of reaction. "In any case," they will say, "we feel that in a scientific age, men and women should not be encouraged to obtain comfort from mascots, superstitions

and similar devices." I dare not think how anyone will try to explain that ghosts can make noises, set up material pressures or wear clothes which must also have souls if we are to believe every claim.

It is possible that as a result of the Commission, spiritualism will receive some set-back and will die—so far as séances, trumpets and red lights are concerned—a few years later when the results of the improved educational methods in schools begin to be felt. This will not, of course, discourage investigation of the occult, but such investigations will always have as their object, not the obtaining of evidence to prove a preconceived theory, with the decision to fit it all in somehow at any cost, but the discovery of natural laws which are at present hidden.

The idea that spiritualism implies faith alone, is a misconception. It requires more faith to believe in an ideal for which there is little or no concrete evidence than to believe in one which is supported by material statements, or, as some people like to call them, facts. Many millions of people, who do not require audible voices or misty vapours to act as a crutch to their faith, believe in a hereafter and immortality. A witness for your faith may be useful, many brilliant men have depended upon mascots, but it is a mistake to confuse the witness with the faith !

Under occult phenomena will probably be included for some time the means of communication now called telepathy. I doubt if there is evidence of telepathy which could be accepted by a scientist to-day, other

than that of crowd psychology or cases of transference referring to the major emotions of hunger, fear and sex. That animals or insects communicate without the use of apparent sight, touch or sound may only imply that the degree in which these senses are employed differs from that appertaining to human beings, or that other sensations, which are none the less physical because they are unknown to ourselves, are in use. All cases of communication over long distances without the intervention of mechanical apparatus can be explained either by coincidence, faulty timing, or "seeing across time." But I do not doubt that scientific experiments will result in the human brain being so developed that it becomes sensitive to messages sent out by other minds. Signals may then be communicated simply by some effort of concentration in a manner quite foreign to us at present. It may become necessary to wear helmets to protect men and women from the attentions of advertisers who will have a whole room full of special telepathists sending out suggestions to eat so-and-so's patent food or to buy a seat at the hypnotic contests between two heavybrains.

Some people consider the so-called evidence of reincarnation "occult." Many will tell you something of their life in a previous "existence." In the broadest sense, reincarnation might be a perfectly true theory, matter is indestructible and you may have in you at the moment the atoms which went to make up a Roman Emperor or which will make a super-man. In the intervening stages, the atoms, perhaps, formed part of a pig, a buttercup or a daily

newspaper ! It is really a very beautiful theory of the circle of life which includes incarnation, immortality, or the future life of nearly every creed. But, if there are any people in the future who believe in literal reincarnation, they will have had exactly the same "past existences" as those of to-day ; Roman gladiators, queens of Egypt, even bad women ; but never, *never* the missing link, a Chinese assassin or a Hebrew Shylock ! We are so proud of inheriting the shape of a horrible dirty nose that we forget the possibility of the same occurrence in the case of memory. Our grandfather saw a ship ; so may we too if a slightly used cell is rendered active. We forget the relativity of thought. We gloss over the horrors of magnification and do not yet understand that if a man is painting the hands of Big Ben, he may be quite unable to tell the time therefrom.

Science and the occult will always be enemies until vanity of knowledge is overcome and until lack of faith ceases to be regarded as a crime.

The discovery and classification of natural laws may be useful, but to regard as "impossible" or offensively occult anything which does not fall within these laws is sheer bigotry for which, indirectly, the confirmed spiritualist has only himself to thank. I believe that it is our duty most keenly to investigate certain statements which might affect the whole tenor of life. It is pitiful to listen to unsupported claims, to abuse from enthusiasts who should be the first to help others to their own happiness.

All the jargon of the séance room, the professional medium, ectoplasm, "planes of life," puerile lectures

and humbugging trust, have been quite unable to kill the underlying truths of spiritual continuity. It seems clear that matter and energy cannot be destroyed, only changed in form. Why, then, should our life, or the personality which our emotions produce, prove any exception? It may be logical that sympathetic "instruments" are needed for reception and that certain lights destroy materials which hover between mind and matter.

Is it not all the more necessary that we should walk before we run? The products of thought are capable of investigation by instruments not yet in being. There are countless examples of apparent miracles all around us in a world limited, at present, by our lack of direct observational capacity. I believe that these facts can be metricized and checked by true scientific methods until a new theory of our presence in this visible world is evolved.

It is quite possible that the discovery of radio-emanation, the visible lights in the total spectrum, or even the systems of so-called telepathy, which unquestionably exist in the case of insects, are all facts telling us something of the system of the mind, and of the presence which appears to live outside our material bodies.

But it is vain to believe that we have stepped so far that the barriers of death are completely conquered. More than vain to pretend, that experiments which can neither be repeated nor demonstrated by material methods for material results, are as yet whole-heartedly believed by any gathering of persons who are either representative or normal.

CHAPTER XVII

The Family of the Future

MARRIAGE and the upbringing of a family have dominated the world's history for the last ten thousand years. Examine one basic cause of any war and you discover the urge either to take another man's wife or to find bread for children. Many great efforts have owed their inspiration to these circumstances. If it had not been for growing families, large tracts of the world would still be unexplored and uninhabited. But I cannot believe that the men and women of a century hence will allow this factor to work uncontrolled. In so far as it inspires men and women to conquer new worlds, the urge is good. Love, it was that first built a bridge to begin the history of engineering. Primitive man did not worry about rivers until he saw a beautiful woman on the other side. Not necessity, but love was the mother of invention.

It is this force which has also been at the root of much evil. In order that the woman might not have to soil her hands by hard work, the merchant of a few centuries ago purchased human bodies for a few pounds and made them into slaves. So-called affection and religion between them have been responsible for most of the ghastly massacres, battles, and murders, in the history of the world.

The wise men of the future will say : “ Here is a tremendous force—it seems to be, unfortunately, the strongest thing in human relationship. It can be used for good or evil, according to the way it is controlled. We would no more let it run free than we would allow a river to rush down the main street of a town or fires to be lighted in any part of the house. Strength is only useful according to the degree in which it can be controlled.”

Long before the year 2035, the various states of the world will have taken to themselves the right to order the number of children which a woman may bear. The rulers will very logically argue that if a man demands support by the State or “ the right to work,” the country has an equal right to decide how many children he shall have ; in other words, how many people have to be supported.

Our children will read in their history books of one momentous event in British history during the year 1932. This will have nothing to do with gold standards or economic crises, but simply the setting up of a Royal Commission to examine the principles and practice of sterilization for the unfit. They will read with amazement, perhaps, that at that time any man, sane or insane, healthy or diseased, could marry any woman, also healthy or diseased, who was not related to him, and have any number of children, any or all of whom might be sane or insane, healthy or diseased. It is difficult to imagine what they will say about their ancestors, but they are sure to note that thousands of years previously, the Romans took steps to ensure that only the fittest survived, and

they will marvel that twentieth-century men and women, whose knowledge of genetics and medicine was so far ahead of the Romans, did nothing to prevent the birth of diseased children and did not trouble if lunatics produced a dozen children, all mentally deficient. They will note that no practical results came from the Commission of 1932 ; but the establishment of the principle that the State had the right to sterilize will mark the beginning of a new era.

It will be many centuries, I believe, before our knowledge enables us to select perfect parents to produce perfect children. The amount of control that will be exercised by the State one century hence, over marriage, will be comparatively small. The government will insist that those with inheritable failings, most of which are brought about by wanton excess, shall forfeit the right to children of their own. Instead of sentencing the deficient criminal to a long term of captivity, which will not change his mentality in the least, the judge of the year 3035 will order the Court to perform a simple operation which will have no ill-effect on the prisoner at all, but will ensure that he has no offspring to inherit his unhappy attributes. No doubt, in his summing-up, the learned Judge of that time will pass some caustic remarks about the system of law, fortunately since revised by wiser men, which not only failed to cure a criminal, but allowed him perfect freedom to mate with whom he would and give to the world a dozen or more creatures with obvious liability to mental and physical weakness.

Marriage is, as the comedians insist, one of the most serious steps that a man can take. Yet, to-day, it is as easy to get married as to buy a dog licence. The cost in each case is about the same, which, perhaps, shows the attitude of the State. The Government says, in effect, "Get married. I will charge you a few shillings for entering your name on certain lists in order to see that you don't commit bigamy, or if you do, that you are duly punished." Nothing is said about children, although if they are born, it is the State—that is you and I and a few million ordinary folk—who have ultimately to support them, should they be feeble minded or diseased.

When you are married in a church, you are told that the object of marriage is to prevent fornication and to beget children. Indeed, the impression left by the marriage service is that the uttering of certain prayers turns something which is wicked and unnatural into something good and legal.

Our children will read of these things with amazement. They will pay nothing for being married, and perhaps five pounds for a dog licence. The State will realize that marriage is the most beautiful bond which can exist and will encourage it in every way. But, as in the case of dog owners, it will insist that the would-be licensee shall show that he is properly qualified. To-day a man can starve a dog to death and walk to any post-office to buy another licence. Once a man and woman can prove that they are healthy, mentally and physically, that their parents were healthy and that there is no reasonable bar to their union, the State will make everything easy. A

government official will, perhaps, be appointed to offer advice which will be more useful than hymns and wedding breakfasts, and there may be the offer of an examination, to be undertaken voluntarily, to discover whether the man and woman are likely to live happily together ever after. A few laboratory tests would discover the leading characteristics of each partner, and a reference to carefully-kept tables of causes of unhappy marriages would indicate the final probabilities of the union.

Our children's children will not regard divorce, the very name of which has an unpleasant flavour, in the same way as we. To-day, any couple who find that life in the same house is not all that was expected have to face many unpleasant problems. Divorce is not granted unless there has been unfaithfulness. The idea of separation by mutual agreement causes many to lift their hands in horror, and so we have the nasty business of hotel bills, keyholes, professional co-respondents and divorce courts.

If, after two or three years of marriage, my great grandchild and his wife discover that they are unable to live a full life together, they will fill in a form and, on an appointed day, present themselves to the Matrimonial Officer. After a medical examination to discover whether the supposed incompatibility is due merely to physical causes, such as a weak digestion or overwrought nerves, the couple will be tested in a laboratory, and the root cause of their disagreement found. If this is found to be incurable, signing along the dotted line of a paper will dissolve the contract.

I think it is more than probable that two or more

forms of marriage will exist. One will be the "simple" union, which will first be undertaken by all couples, entitling them to live together so long as they do not have a family. The arrival of the first child will mark the beginning of a second, and more binding, period. Divorce during this period will entitle the State to remove any children from the home, bring them up in its own institutions or make other suitable arrangements. It is bad for young people to live in a loveless house.

The State will probably reserve the right to remove children from incompetent parents at any time. It is amazing, in a civilized age when so much is known about the upbringing of children, that parents should be allowed to do exactly what they like, so long as they do not physically ill-treat them. Physical ill-treatment results in the parent being summoned in a police court and punished, but as soon as he comes out of prison, he goes back to his home! Again, the mere environment of an unhappy home may have far more effect on a child than direct legal cruelty, but children may see their parents behave like primitive savages, without the State having the power to intervene. Very similar conditions apply to men and women who can live in armed neutrality without possible redress by either party.

If we travel a little further into the future, we shall find that governments will decide which parents shall have children. At first this will be brought about by offering men and women who have been specially selected after thorough examination a bounty for every child,* but eventually it will become a

criminal offence to produce children without permission. Moreover, the State will undertake the upbringing and training of everyone, and will thus eliminate a few wastrels, criminals, and snobs whose failings are due entirely to neglect by their parents.

Whenever the control of love and marriage—many foolish people always speak of these two conditions in the same breath—is mentioned, we are always told: “Ah, but you will never change human nature. Men and women will fall in love ten thousand years hence and upset all your plans.” People do not realize that the love of which they are talking, the kind which breaks bolts and bars, is usually a passion, like anger or hatred. I imagine that the idealists of a thousand years ago who suggested that burning women at the stake was a horrible thing and should be abolished were told: “Ah, but you will never alter human nature.” Change affects human nature in the same way as it affects everything else, and we are already finding methods of speeding up this difference in the biological laboratory. I have no doubt at all that the young man of the future who contemplates an unwise marriage, instead of being “lectured” by his father, will be given a dose of some chemical, and his whole attitude will change. We joke about mediæval witches because of their “love philtres,” just as we laughed at the alchemists for their attempts at transmutation. Even to-day there are a dozen “love potions” known to chemists, and before long we may make much greater use of chemical compounds which control the emotions.

Most people know that heroism is largely determined by the amount of adrenalin in the body !

Builders of Utopia populate it with supermen or beings like gods. The men and women are physically and mentally perfect, although there may be a few people of lower mentality thrown in to act as drudges. The idea of a race of supermen is very fine, but I do not think that science will be able to breed deliberately in this way, for very definite reasons.

Many people have toyed with the idea. If, they say, we can take horses, and by skilful breeding produce an animal that has many fine points, why should we not be able to do the same with the human race ? Theoretically, breeding men should be no more difficult. Each of us is the result of the mating of about thirty-two ancestors or eight generations. Knowing this, it would seem easy to select parents of the right types, and in the comparatively short time of eight generations, or two and a half centuries, to produce with absolute certainty wonderful men.

But human beings are mildly distinguished from animals in possessing a thousand additional mental facets, all of which we believe to be hereditary. It may be that the same applies to the brute beast and that we cannot yet understand their natures. According to the amount of these characteristics, they are good or bad. An excessive tendency to thrift, for example, makes a miser, too much generosity degenerates into prodigality. Yet both these features, in reasonable quantities, are good. The horse breeder has not quite the same troubles, his charges cannot have too much* speed or too much stamina. A

superman is not one who possesses every quality to the highest degree, but one who is perfectly balanced.

Apart from this difficulty, there is another which is apparently insurmountable. It seems entirely a matter of chance as to how the various characteristics from the two parents and the other ancestors are inherited. Sons of a genius are not infrequently remarkable for their feeble-mindedness. A giant will have three sons, one tall, one short and another of average height. The characteristic tendencies in the course of generations have become so mixed that it is almost impossible to disentangle them, and before beginning to breed either supermen or super-horses, "pure" stock is required; that is to say, parents whose characteristics are absolutely defined. It is not hard to obtain pure stock for sweet peas, on which the first famous experiments on heredity were performed, or even for horses, but it would be virtually impossible in the case of men. I doubt whether even the inhabitants of the remotest island are sufficiently pure. Perhaps, when the laws of genetics are more fully understood and the theoretical knowledge necessary for race-breeding is at hand, a band of noble pioneers who are ready to sacrifice comfort for the future of the race will buy a South Sea island and found a self-contained community, strictly on eugenic lines, with the idea of ultimately producing stock which supermen and superwomen will evolve. Such an experiment, to be successful, will require a degree of sacrifice of self for the race which is unknown to-day. In the case of some animals that we call "lower," we can find hundreds,

driven blindly by heredity, willing to sacrifice themselves for the common good of the tribe, but not amongst human beings. Our great-great grandchildren will see the beginning of this new spirit and will be taught, not that it is nobler to die for country on the battlefield than in your bed, but that it is far better to perish for the sake of the human race than to live uselessly.

That scientists, once they are given control, will be able to strengthen certain characteristics is much more certain than that they will be able to breed new types. I think that in the future we may find in another guise the caste system which has held sway for so many centuries in India. The original idea was, of course, this breeding of men particularly suited to certain tasks. Lacking our scientific knowledge, early philosophers were yet wise enough to see that if a group of families engaged, for example, in gardening, did not mingle freely as regards marriage with other families who were money-lenders, the children to come would probably be better and better gardeners. In essence, these philosophers were right. The Indian caste has failed because it has not been sufficiently ruthless or flexible. On the one hand, the weaklings have not been weeded out, and on the other, no allowance has been made for changing standards. Our children will immediately banish from their particular class anyone who fails to show the desired characteristics. The expelled person may be made a member of some other caste to which he seems more suited, or relegated to the "outcasts."

I should make it clear that this principle will have

little in common with systems such as are practised to-day, and that it will be on purely scientific lines. Probably, the word "group" will be used, instead of caste, which has come to have an objectionable meaning. By first testing men and women to discover their particular talents, and then providing the best possible environment, scientists will be able to avoid the terrible tragedy of the square peg in the round hole. No longer will there be poets pining in city offices, or men who should be engaged in engineering wasting their time in ploughing land. Special diets and courses of training will be necessary to ensure that the selection which is made at birth is not wasted later.

Paradoxically enough, the men of the future will find that the further biologists press their ideas on selective breeding, the more difficult it will be to produce supermen. Already, many have complained at the lack of outstanding personalities. But this lack is entirely comparative. The average man of the twentieth century would have been considered a genius of the first class four centuries ago. Men who to-day add up figures in banks might have been brilliant Chancellors of the Exchequer ten centuries past. The whole standard has risen so greatly, that to rise above it, a man has to have incomparably greater powers than ever before.

If you or I could be transported centuries forward in time and dumped into the future, we should probably be painlessly put away as mentally deficient morons! Our brain capacity would prove so much below the average that we should be considered

degenerates. We should not be able to communicate by telepathy—a failing which would be considered on a par with being unable to read or write to-day. We should, perhaps, mention the fact that we felt hungry, and the men of the future would be so shocked to think that any human being, as distinct from animal, was so gross as to think of his stomach that they would send us for vivisection to discover which of our glands had become moribund. The sight of our teeth and toe nails would prove inexpressibly horrible.

The men and women of the future will have before them a much clearer idea of the reason for life than we have to-day, so that the improvement of the race will be more sanely considered. Everything will be sacrificed to general progress. The life of an individual, or even his happiness, will be considered only in relation to the race. Ask any man in the street to-day why he is alive, or why he should be allowed to go on living and he will either stammer something about “the right to live” or smile at you as a lunatic requiring humouring, and pass on. But this is a vitally important question. Unless you and I are doing something, however small, towards making man a better creature, we might just as well be painlessly put to death and our places taken by others.

Marriage, therefore, will be governed largely from this point of view, unless it is made into a circumstance which has nothing to do with children. Some writers, perhaps with the idea of appearing shocking, rather than of seeking truth, have suggested that in the future the State will run what amounts to

“stud” farms for human beings. Although marriage will be strictly controlled and the number of children limited, I do not think that this idea will become reality. There are many unexplained facts in heredity. The beginning of life is something more than a chemical combination that can be expressed by our present symbols. The children of “love matches” are often brilliant, although their parents may subsequently be divorced on the grounds of incompatibility! It is possible that some ætherial movement which plays an important part in determining the capabilities of a child will be eventually discovered. Already we appreciate that a mother’s thoughts can have a profound effect on her unborn child. The minute differences between well-bred and badly-born persons are largely a matter of emotion and certainly could not be permitted in any organized community.

I do not believe that our followers on this earth will be more promiscuous or “immoral,” even according to our standards, than we are. Appreciate the fact that morality and immorality are largely matters of geography and time, and you will realize that the vast majority of men and women are, and always have been, moral. When morality is based on scientific laws and not on taboo and superstition, men and women will be moral from choice, instead of fear.

Unhappy marriages will be the exception rather than the rule. The myth which, I regret to say, has been fostered by the Christian religion, that a ceremony in a church, the saying of some prayers and the pronouncement of a blessing can make a man and woman “happy for ever,” will have disappeared,

and with it the cause of many wretched and unscientific matings. The idea of a "twin soul," in films and fiction, will probably be strongly censored by the government, instead of, as to-day, encouraged as moral. Scientists know that you have to do rather more than look into a person's eyes to discover an affinity. Laboratory tests may discover "suitabilities" which at first glance would seem non-existent. We all know of marriages of "convenience," where neither side has professed "love," which have turned out far more happy than the majority of unions between alleged lovers.

Men of the future will, perhaps, be puzzled when reading twentieth century history, to discover that the Church pronounced the soul the most important part of a being and in the next moment joined two souls "until death us do part."

To our eyes, this picture of marriage in the future may seem cold, calculating and lacking in "romance." Our children's children will have discovered that "romance" is to be found in the pursuit of knowledge rather than in country lanes by moonlight. They will regard our present customs in much the same way as we look upon those of savage tribes where the wife is briefly clubbed over the head by the bridegroom and dragged to his hut by the hair!

CHAPTER XVIII

The Weather of the Future

IN all probability, forecasting was first connected with the weather. No one can tell how old are some weather sayings, such as "Red sky at morn." Obviously, mankind tried to prophesy about the weather very early, because it was so often a matter of importance to his daily bread. The earliest farmers wanted to know when they would have a dry spell for hay making, or whether there was likely to be a frost, so they looked for signs in the sky. It is interesting to note that this forecasting has always been more or less scientific, that is, based upon repeated observations, and not upon inspired works or words. The farmers noticed that a red dawn was often followed by a wet day. Perhaps they did not understand why, but they immediately took red skies in the morning to mean rain, and they were usually right. Perhaps, by a coincidence, a cow-man noticed that on three separate occasions before a thunderstorm he saw a magpie on the lefthand side of the road. He concluded that a magpie on the lefthand side of the road meant a thunderstorm. He was lead astray by coincidence. If he had been a scientific observer he would have known that before formulating a theory upon observed facts, it is

necessary to see that it suits all conditions, and that no other theory agrees equally well.

To-day, weather forecasting is of vast importance. Aeroplane pilots, sailors, holiday-makers, farmers, ice-cream vendors, promoters of open-air sporting programmes and insurance companies, all want to know what the weather is going to be. The matter has become so vital, in fact, that anyone who could give long distance forecasts with certainty could make a fortune. If business men whose receipts depend upon the weather, are prepared to pay eight pounds per cent. and upwards at Lloyd's for a sunshine policy in June, it is obvious that anyone who could really give you an exact description of the weather during any three consecutive weeks would be particularly fortunate.

Weather forecasting will become a very much more exact business and far distant from prophecy. As yet, our knowledge of conditions in certain parts of the world, notably at the poles, is small. But meteorological investigations are being made, cause and effect studied, and cycles built up. I do not doubt that our children's children will place very great faith in the daily weather report, instead of, as I have heard people do to-day, saying: "The wireless says it's going to rain, so we're safe to go for our picnic"!

On the wall of every house will be a television screen, and by touching a button, we shall be able to see into the future weather forecast. An actual map of weather conditions over a wide area will be broadcast, for in many cases the ordinary citizen will

not be interested so much in whether it is going to rain or thunder in his own town, as in Africa or China, where he is proposing to take the week-end trip. He will, of course, be able to read weather maps, which will be much more elaborate. To-day, the man or woman who can read these plans is an exception. But boys of the future will learn such things just as children of to-day are taught to tell the time.

From many points of view, the weather will matter less and less. All homes will be automatically heated from central stations, with thermostats automatically adjusting the temperature to any required degree; frost and heat waves will not matter so much, except to a few farmers who are not equipped with electric plant, and even they will be comparatively independent. The scientists of the future will, obviously, by means of local control, do all they can to make men independent of rain, sunshine or snow.

When reading historical novels, I am always amazed by the apparent indifference of our ancestors to comfort. They made fires in the middle of the room, and let the smoke trickle out of a hole in the roof, rain came in, but they did not seem to worry. Days of continuous snow, stopping all traffic, and droughts, were experienced with philosophical indifference. To-day, it seems incredible that people should actually go out in the rain without macintoshes, that they should have to do their shopping in the open, or travel in railway coaches like cattle trucks.

But what will our children think of us? They will read that young women of the twentieth century

had to have a dozen pairs of silk stockings, because the smallest shower spoilt them ! They will read that snow could hold up traffic on main roads and that a heavy fall of rain resulted in floods in which lives were lost and thousands of pounds' worth of damage done. They will read, and we can imagine their astonishment, that, whereas it was thought worth while making huge dams in Egypt and India in order to store water for irrigation of crops, no one bothered to ensure proper drainage in certain industrial areas. Lives were allowed to be lost in spite of insurance ; international weather was unknown. They will be as mystified to hear that we could be comfortable over a coal fire as are we to know that a savage cooked his meals over a few glowing tree logs. It will stagger them to find that, although we took elaborate precautions to purify the water we drank, we breathed foul, foggy air, without worrying at all or even taking the simple steps necessary to conquer fog.

There will be no fogs of the "pea soup" type which we know so well to-day. The proper use of coal as fuel will ensure that, but there will be mists, petrol fumes and other impurities in the air. Everyone will take steps to see that the air in their homes and offices is pure. All windows will be fitted with filters, through which air will be drawn by suction, disinfected, warmed or cooled according to the weather outside, and distributed to different rooms by hidden tubes at the floor level. Foul air will be removed and pumped outside, for our children's children will consider it just as insanitary to sit in rooms without proper apparatus for air conditioning

as we would to throw our slops in the middle of the floor, instead of down the drain.

At present, filtering and distributing systems are used only in super-cinemas, and in the House of Commons, where, of course, it is necessary to draw off the hot air. But all educated people will soon object to the alternative of sitting in a draught or roasting over a fire. Lungs will not stand it in a few thousand years. People will realize that temperature is not the only factor in securing a comfortable atmosphere, that humidity is equally important, and that the amount of water vapour in the air should be automatically controlled with the heat available. This matter will be considered of great importance in factories, workshops and offices. Scientific investigation will be undertaken to discover the ideal temperature and humidity for undertaking certain tasks. It is evident that the stevedore and the filing clerk would not find the same temperature ideal. This investigation will result in greater comfort for workers, and, consequently, in better work.

“Internal” weather will be very strictly controlled, and as more and more streets are completely arcaded, enclosed weather will become of increasing importance. But I do not think our scientists will be content to direct the “weather” inside the houses of the future and to forecast the weather outside. I think they will want to achieve some measure of control over local weather conditions, so that chance may not decide the success or failure of events which still have, of necessity, to take place in the open air.

Many attempts have already been made to produce

artificial rain, with a varying measure of success. These early experiments will probably be developed, so that, in the course of fifty years, it will be possible for a millionaire to be perfectly certain that his garden will not suffer from drought.

Rain has been produced artificially by condensing the moisture in the air. The men of the future will probably discard such comparatively clumsy methods as are used now. To shower electrified sand over a wide area is an exceedingly expensive business, calling for many aeroplanes flying continuously. At the present moment, it would probably be cheaper to take the water in pipes and spray it with hoses. I believe that the method used in the future will be entirely electrical, although the quantities involved seem almost impossible to-day.

It will be realized that the problem is not one of producing water, but of condensing water already present in the air as vapour, and allowing it to fall in drops upon the ground. At first, ice in finely-powdered form was used for this purpose. It was argued that the powdered ice would cool the surrounding air, make the water condense and let it fall on to the parched land. Future scientists will, perhaps, be amazed at this experiment, which is like burning a house to roast a pig, as it would probably be almost as effective to carry up water in aeroplanes and let it fall.

When the laws of cohesion are more fully understood, some comparatively simple electrical apparatus will serve to make the minute particles of water vapour group together to form drops so heavy that

they have to fall. A similar plan may help us to deal with fog, for there is always some water in the air. Even over deserts like the Sahara, where rain does not fall in appreciable quantities for years on end, scientific instruments would reveal quite a quantity of water in the air. But, owing to the high temperature and other conditions, the water does not fall as liquid water, but remains suspended. Every housewife knows that a hot August day is not necessarily the best for drying clothes. The air is fully charged with water vapour, although there seems no possibility of rain owing to the high temperature. A cold glass held in the open would immediately be covered with a film of dew.

I think it will be found that any method depending upon temperature for the production of artificial rain will be far too expensive, even in days when aeroplanes are as cheap as pedal cycles. But electricity has the effect of making molecules unite physically in larger groups, and by passing electrical charges from one aeroplane to another or by scattering some charged powder—sand is too heavy—artificial rain may be produced at a reasonable rate. The use of vortex guns is likely to be replaced by vortex electrical radiation.

Artificial rain from the air will have tremendous effects. Irrigation has already turned many deserts into fertile plains. By artificial rain, man may be able to turn arid land into farms and fields, while power direct from the sun supplies the necessary energy. It is largely a question of whether it will be found cheaper to conduct water many miles by

land channels or to condense moisture from the air. As the population of the world grows, and in spite of more intensive methods of agriculture, the problem of feeding the millions will become acute, and bolder attempts to convert these wasted plains will be made.

The problem of ensuring sunshine is really much the same as that of producing rain. The holiday maker does not complain that it is wet, but that it is raining over the town which he has happened to choose for his annual vacation. To guarantee sunshine, it is only necessary to condense the rain before it reaches the spot which must be protected. Publicity committees of holiday towns will, in the future, be able to advertise: "Come to Sunny Sundown—Sunshine Guaranteed. A hundred pounds reward to anyone who can prove it has ever rained at Sundown in June." They will charge, perhaps, a rate of a penny in the pound for the weather, and with the money thus secured make certain that all rain is brought down several miles outside the town, so that the sky above is always cloudless!

If æther transmission without wires does not become common, aeroplanes attacking great rain clouds will be a familiar sight at the seaside. The experiment has already been made in Daytona, where it was found that seventy-five pounds of sand, charged at 12,000 volts, broke up two square miles of cloud. It would take a fleet of aeroplanes and a good deal more sand than the seven maids with seven brooms could sweep up, perhaps, to keep an English seaside resort free from cloud during a typical "summer." When methods become comparatively cheap, it may

be found worth while, as no doubt many people would be prepared to pay a considerable sum to secure a rain-free holiday.

Obviously, this brand of progress will require very careful control. The dispersal of a small cloud might not do much harm to the people below, beyond making them put up their umbrellas. But a real rain cloud is many hundreds of feet thick and heavily charged with moisture, and the effect of this vapour being suddenly condensed might be disastrous to the towns and villages immediately below. "Sunny Sundown" might continue to enjoy the sunshine, but a few miles away, villages would be flooded out. I cannot think that the Government of the future will allow this to happen. Pleasure resorts may be severely rationed in sunshine or forced to keep up a well-drained "No Man's Land" on which the rain could fall without harming others. Perhaps, the simplest control will come when it is found that weather can be distributed by wireless waves. Already it has been noted that moisture surrounding a wireless aerial is dissipated when broadcasting begins. The official bureau of the future will broadcast weather forecasts in which it will be explained that weather engineers have been instructed to allow so many millimetres of rain to fall in such and such a place, but that elsewhere it will be fine. There will then be no excuse for the holiday-maker who is caught in a shower, for he will have had ample warning.

The question is not so much one of quantity as of distribution and timing. The most ardent sun worshipper would soon become tired of continual

sunshine, and, further, the effects upon health would be serious. But he does ask that it shall rain at nights, instead of during the day and never on Bank Holidays. This little matter the Government of the future will be able to arrange. What an opportunity for a competition or of "consulting the wishes of our readers," during an election !

Frost causes damage to the extent of many thousands of pounds a year, but, by breaking up the soil, it also does the farmer a very good turn. Of course, burst water pipes due to frost will be unknown in the future. Any architect who dared to design a house with unprotected outside pipes would be prosecuted for criminal negligence. But the problem of electro-chemical crops will still remain in some parts of the world. Frost will prove easier to disperse than rain, and I do not doubt that farmers will be able to legislate for no frost after a certain date, such as March 1st. On the other hand, they would be able to secure cold weather when required, preparatory to sowing in closed forcing sheds. Motor cars will use waste heat, instead of wasting it in vulnerable radiators and, of course, long before weather control becomes an everyday affair, our roads will be constructed so that neither rain nor frost interfere with them, should they be exposed in a few distant places.

I have heard many people solemnly assert that the weather grows worse every year. We talk of "old fashioned summers" and "old fashioned Christmases" as if every summer during the last century was one long blaze of sunshine and every Christmas accompanied by a fall of snow. Statistics do not

bear out this supposition. They show that the weather has been very much the same ever since records have been kept. There have been wet cycles and dry cycles, but over several centuries we have nothing to establish that, on the average, winters have been snowier or summers hotter.

When people say : "The weather is not what it used to be," the obvious answer is the famous : "It never was." But this does not mean that weather is not changing. If we speak of geological time instead of human time, we know that ice once covered the whole earth and that at another time there was perpetual sunshine, even at the poles. Meteorologists are now embarking upon a study of the weather of the future in the broadest sense of that expression. They suggest that a time of perpetual sunshine is again approaching, although no person living now will see it arrive.

It may appear that the people of the future will regard the weather as of comparative unimportance. This will not strictly be true. They will not worry because it happens to rain on one particular day which for some reason they wished to be fine, or because it freezes when they are above ground. But, from the point of view of harvesting and preparation for the future, the weather will still be of great importance. If experts declare that the following year will be one of unprecedented drought, they may decide not to sow their crops, but to rely on stored grain, or to make the necessary arrangements to overcome the water shortage.

The study of long-range weather forecasts will,

therefore, be extremely useful. It may decide, for example, whether the exploitation of some new type of fuel requiring vast sums of capital is worth while. If we thought that the poles would unfreeze in the near future, we would not, perhaps, worry about fuel, knowing as we do that there are vast deposits of easily-mined coal lying under the ice.

The study of glaciers enables us to determine to a degree whether the earth is, in fact, growing warmer or colder. Glaciers are formed during periods of intense cold, and those which still exist are probably relics of an ice age. Measurements made over the course of a number of years in the case of some five or six hundred glaciers suggest that the earth is warming, and ice steadily receding. By minute measurements it is possible to find the relative position of a given spot on a glacier every year, and according to whether this mark is further down the slope or up it, the glacier is said to be advancing or receding. Professor Mercanton of the University of Lausanne, after a study of such movements for fifty years, has definitely come to the conclusion that glaciers are very slowly disappearing.

In centuries to come, therefore, we may enjoy sunshine such as we have only known in dreams. Although when it is drizzling and we want to be sunbathing, we may envy them, I am not sure that the world will be better off. In the case of Britain, the changeable and uncertain climate has produced certain valuable characteristics. Dwellers in warm climates are notoriously indolent. On the other hand, the new climate may exactly suit the type of man

who will do vastly more thinking at the expense of much less physical labour. Modern man has made the tropics habitable by his inventions. I believe that the men of the future, with their vastly improved methods of securing comfort, so that their brains can function more efficiently, will make every part of the earth habitable, quite regardless of natural climate.

For many years, weather has called the tune. Man has based his clothing, his methods of working, his food and almost his whole life, upon the state of the weather. We are now independent as far as housing goes. One day, we shall rule the weather instead of allowing it to rule ourselves. Long-range forecasts will enable us to work machines for storing solar energy economically, to sow crops profitably and to plan life with less wastage of time. Local control will give sunshine or rain as required. Man will forget the weather and leave it to some over-staffed department, planted thickly with super-brains and jellied bodies in a fashion no more famous than a modern Department of Inland Revenue.

CHAPTER XIX

The Robot Age

IF there is one thing which should appal the thinking man of to-day, it is the sight of a girl selling matches and interminable cigarettes at a penny or sixpence a box. "Mechanically" taking a packet from a shelf and handing it to someone in exchange for a coin is not work for a human being with a mind and, perhaps, a soul. It is true that woman has sold her birthright of home for a place in the struggle for competitive existence, but it is not necessary to occupy a position which could be equally well carried out by an electric current or a coil spring. In the future, many mechanical tasks which to-day are borne by intelligent men and women for a few shillings a week will be more effectively performed by machines at one-tenth part of the cost.

The robot of fiction will never be created. In appearance alone, the imaginative robot is a conglomeration of scientific absurdities. Why should a machine have hands and feet like those of men, much less a face which serves no purpose at all except to remind us that we have the remains of tree trunks and sea water strainers always with us? The robot of the future will resemble an intricate wireless set, controlled by valves and motivated either by stored

or broadcast electricity. It will be equipped, perhaps, with a receiving set for taking orders, and a loudspeaker for giving answers which will be correctly chosen from a series of sound films stored inside the box "body."

It is doubtful whether it will have legs. Wheels are a more convenient method of securing locomotion and there is no reason at all why robots should be clad in armour as a concession to Hollywood. A whole mythical atmosphere has been created for the sole purpose of future fiction, like that of Ruritania and the desert for other types of story. The world of the future, peopled by armour-clad robots with flashing eyes and mailed fists, is as absurd as the musical comedy country in which the Prince always marries a commoner, or the desert in which the Sheik keeps a harem of half-willing white wives.

The idea of robots "rising up" and attacking their creators is as puerile as the suggestion that a portable wireless receiver will one day bite your hand as you move its controls. The fundamental difference between man and a machine is what psychologists call "will." The most intricate mechanism in the world cannot perform any task, however simple, other than that which it is set to do. A touch of a switch will immediately stop its motion. The robots of the future will be more controllable than the modern motor car, for the fact that automobiles kill their owners is not a sign of resentment by some part of the chassis, but is due to a lack of understanding of the principles of cause and effect on the part of the driver. If it was really appreciated that a car travelling at sixty

miles an hour striking a hedge must result in some of the momentum being destroyed by the body of the owner, who is not capable of withstanding the strain, brakes would be applied in good time. Few motorists realize that modern speeds have effects essentially different from those applying to a stage coach.

The so-called robots will, however, perform many small but necessary tasks which are now allocated to human beings. The nurse sitting by a baby's bed, for example, will be supplanted by a mechanical device which, in response to a telephone call from the anxious mother, can inform her if the child has woken up, whether the heating of the room is correct and so on. If the temperature is found too high or low, the robot will adjust it in response to telephoned instructions and at the correct time feed the baby, leaving the official mother to visit her friends on the other side of the world, with the same freedom from worry that a modern mother enjoys for purposes of bridge. But no human nurse will be required. A robot of this type could easily be constructed at present, but we have not yet sufficiently appreciated the value of automatic labour to make mass production worth while. Years of education were necessary before Henry Ford could appear with his motor car for everyone. There will have to be many experimental robots before the automatic nursemaid can be obtained for five pounds, complete with extras, and no charge for fitting. Labour will be freed for useful purposes or even for enjoyment. Machines save time, not work alone.

Robots will work in every room and street. Traffic is already being regulated automatically and with greater efficiency than could be achieved by any policeman. A mechanical butler for serving simplified dinner will not prove hard to construct, and the servant's registry of the future will be a factory filled with electrical housemaids, chauffeurs and gardeners. In workshops, more and more mechanical tasks will be performed by machinery. It is ridiculous that an intelligent man should have to count newspapers as they come from a machine or packets of salt when delivered from the refiner. A robot using the "invisible ray" will count packages as they pass on an endless chain, and the same type of robot be used for sorting, grading and delivering tasks of all kinds.

In a picture I once saw, purporting to show the world of the future, a mechanical man was placed in an operating theatre by an enterprising but unscrupulous doctor and given a soul. According to the film, the soul came out of some storage batteries and a Leyden jar, but it was not explained into what part of the body this soul was injected, nor how the brain existed without the delicate tissue which is necessary to sustain the electro-chemical actions of the human "mind." It is possible that in the far future, brain matter may be made synthetically and thought watched through a microscope, but the "soul," if it is ever isolated, may not prove so easy to manufacture and, once built, might refuse to enter willingly into the steel bodies of robots! The whole idea, of course, is based on a superstition as foolish as that of Dr. Faustus, except for the purpose of illustrating a

moral lesson. Nightmare robots need give no one any worry. The whole object of scientists will be to create, not machines which think, but machines which will perform the tasks that require no thinking.

Among more fully-automatic machines, we shall find the most common those used for buying and selling. The historian of the future will note with interest, perhaps, that it was the passing of a series of laws called D.O.R.A. which first stimulated interest in scientific selling. He will find that regulations, originally intended to protect the country during war time, were carried on long afterwards, and that citizens, chafing under the restraint, evolved methods of evading them, or found that machines could not be prosecuted. He will compare this law with a much older one which taxed beards and made shaving popular, and suggest, perhaps, that if the Government wish to hasten the development of telepathy as a means of communication, they should make talking in the streets or any public place punishable by a fine and imprisonment. It will be explained that speech irritates too many people, is unselective and often insanitary to delicate organisms.

The vast store of the future will look much the same as that of the present, except that every article will be kept in a glass drawer. By inserting any coin, the drawer will be released and the appropriate change given. The robot salesman will probably keep up a pleasant chatter about the weather, run from a sound film changed automatically in accordance with the weather forecast. The automatic selling age will not really dawn until each machine is able to give correct

change for any coin, and such sums as $1/11\frac{3}{4}d.$ can be dealt with as easily as the sixpence or shilling.

People of the future will find it difficult to believe that men and women were at one time actually employed in selling a pound of rice for fourpence and a pound of prunes for tenpence. It will seem as absurd as a rickshaw or sedan chair in modern London. The inconvenience of tendering a large number of small coins to the robot salesman may be overcome by accredited customers having a sales check. Upon insertion into the appropriate slot, the check would be imprinted with the value of the goods, which would simultaneously be released.

There are very few articles that will not be sold automatically. Measuring, weighing and mixing will present no difficulties to the robot salesman. If a woman wishes to buy the material for a new dress, for example, she will simply examine small samples presented by the machines until she finds what is required. Turning a pointer to the number of yards she needs and inserting the appropriate coin, the cloth will be unfolded, cut to the correct length, wrapped in a hygienic carton and delivered. If she wishes it "sent home," it will be conveyed on electrically-driven carriers to a packing room, duly sorted, and eventually put into the motor van covering the district.

Automatic machines which mix on the spot have already been invented. Hitherto their use has been restricted to making cocktails. The customer simply inserts a coin in the slot opposite the particular atrocity which he requires, the ingredients are mixed,

shaken, iced and delivered to him in a glass, while the change is shot into his waiting hand. More useful still would be a similar machine for delivering special mixtures to motor cars and aeroplanes. One difficulty of an automatic mixture pump is that two or three different liquids of varying specific gravity are inclined to separate, so that after a few hours the volume delivered might not contain correct proportions throughout.

If men, or more especially women, are still so foolish that they must talk while shopping, this requirement will easily be met by equipping the machines with sound films. A number of buttons on the face of the machine might be marked, "Weather," "Politics," or "Gossip," and in accordance with the switch pressed by the customer, the machine would keep up a flow of the required small talk about the rain, heavy taxation or the latest local scandal, while the purchase was being made.

The electric totalisator has made betting almost entirely automatic. In the future, those unable to visit race courses will be able to "back their fancies" without discomfort. Street betting kiosks will be erected at appropriate intervals and any passer-by will be able to deliver his money or collect his ticket. The booths will be electrically connected with the Government Betting Headquarters in Whitehall, and the amount of money deposited on each horse electrically recorded. It will then be a simple matter for the official in charge to read the odds from a calculating machine and deduct five per cent. for service.

Even marriage may become automatic. In an age of universal wireless and television, it will seem absurd for a dozen different clergymen or registrars in different parts of the country to have to say the same words and ask identical questions. One bishop might probably be appointed solely for marriages, funerals and christenings. Sitting in his sound studio, he would read the service at appropriate times and marry, perhaps, five hundred couples at once. They would sign the register by the fultograph process. For emergencies, a marriage service read by the bishop would be kept in the vestry of every church, recorded on partly-magnetized steel. The happy pair would merely have to run the wire through the reproducing apparatus, which would record their answers, and they could consider themselves married. Possibly, religious people will resent the introduction of machinery into religion, but this argument will not stand investigation. Every church depends upon machinery for its existence, and many bread wafers are machine made. Logically interpreted, this idea that machinery is something contrary to the spirit of God would mean that no church should use electric light, gas for heating, electricity for blowing the organ or anything else dependent upon or produced by science. If cranks and levers do away with local colour, it is that "colour" which is at fault.

There are a thousand tasks performed by human beings to-day which should be automatic: selling stamps and postal orders, receiving telegrams, booking theatre seats, not to mention answering the telephone. It is doubtful whether there will be theatres in the

future, but if so, seats will undoubtedly be booked by means of a large-scale model. Inserting coins in the model seats which he wishes to occupy, a theatre-goer will be able to secure his place, and more important still, know exactly where he is going to sit so that there are no pillars to obstruct his view. All telephones will be mind-operated or loudspeaking, so that it will be unnecessary for the physically weak man of the future to pick up a clumsy instrument and hold it to the ear, and it will be a simple matter for all messages delivered in the absence of the owner to be automatically recorded. If, on the other hand, he wishes to ring up a friend at a certain hour when it will not be convenient, he will deliver the message to his telephone, mark the dial of a clock, and be sure that it will be reproduced at the appointed time. Evidence in law courts which is now taken down in shorthand or laboriously summarized in writing by a clerk will be recorded on a steel strip and kept in store. Anyone interested in the case at any time within the next sixty years will be able to run the steel strip through the reproducing apparatus and hear every word that was spoken.

What is the object of all this mechanization, it may be asked? Will it not result in a large number of people being thrown out of work and the select few living in greater luxury? If human nature remains as it is, the result of the automatic age could be disastrous and the worst forecasts of those who would wreck machines may be realized. But I think the next generation will begin a move for a higher type of civilization. Realizing that the mind cannot be free

while the body is shackled and that all physical or automatic labour is degrading, they will endeavour to shorten what we call the "working hours" to a bare minimum. The business man of the future may not have to spend more than one hour a day upon the degrading business of exchanging goods to make a profit, and the clerk will merely have to supervise a machine which will do all the booking, adding, balancing or profit making, instead of spending eight laborious hours a day in front of a clumsy ledger.

The crux of the matter comes when we inquire what the business man and his clerk will do with the remaining twenty-three hours a day. Leisure to-day is greater waste than labour. If the twenty-three hours are going to be used merely for drinking more whisky, smoking more cigarettes, or hitting more balls with more clubs, our alleged civilization will indeed be in danger of destroying itself. But I think the people of the future will have realized the difference between pleasure and happiness. The older civilizations of Rome and Greece, which were founded on slavery, took their leisure very seriously and devoted it to social betterment. It was not until they began to devote their time to purely sensual pleasures that decay set in and civilization disappeared before the barbarians. The thinking political structure of the future will be founded on the more scientific slavery of the machine. The average man will become better in every way and it is upon the average man that the future of the human race depends for everything.

The idea that machinery is at the root of all the economic difficulties of the world is wrong. In spite

of unemployment, poverty and the slums of to-day, it is obvious that the men and women of to-day are infinitely better off than their great-great-grand-parents ; and far happier if only because they have a greater capacity for happiness produced by increased sensitiveness and brain power. With physical disease banished, labour performed almost exclusively by machinery, and the only tasks necessary for men being those of supervision, the danger of the future will be that men will have no outlet for complaint.

If we realize the fact that each man and woman on the earth has only a certain amount of energy and that this can be used in various ways, we shall understand the position better. Primitive man used ninety-nine per cent. of this energy in securing food for his stomach, shelter for his body, protection for his wife or children and sleeping. The one per cent. of time left over he idled away with a pipe or used in carving on wood. But it was that very one per cent. of time which led to civilization. It was thought alone which led to invention, turned the carving into writing and eventually to printing. To-day we calculate that a man should have eight hours' sleep, eight hours' working and eight hours' leisure ; just seven and three-quarters more daily play than a savage, not including " half days " and Sundays.

In the future, doctors may show us how to cut down our sleep by a certain amount. It is possible that as many people die of over-sleeping, and the accompanying mental atrophy, as of over-eating. But this will not add more than three or four hours to the leisure of the man of the future. Machines, on

the other hand, can add another seven hours a day to his spare time. The idea that machinery is the "enemy" of the so-called working classes is the biggest fallacy imaginable. If it were not for machines and automatic processes of every kind, they would still be in the depths of drudgery, spending all their lives in securing food and shelter. It is not the machines, but our faulty morals which are to blame for distress. If in one country there are 20,000 pairs of good boots and no bread, and in another 20,000 loaves but no boots, it is not the fault of workshops but of the politicians. Indeed, without machines there would be only 2,000 pairs of boots and 2,000 loaves. Once the danger of starving in the midst of plenty is realized, deep-seated prejudices will be forgotten. Economic warfare is a hereditary bequest.

There is another idea, that working with machines tends to make men machine-like. This idea looks better on the stage, perhaps, than in cold print, and I think that the people of the future will become less like automata than ourselves. Once machines have ceased to be objects of wonder or playthings, they will be used. Men will realize the necessity of some mastery over time. That there is no complete control to-day is evidenced by the number of people who say, in effect, "We can't let the car be idle—let's go out." And so out they go, without any object, because they cannot bear to think of wheels being idle. Far better to let machines idle than brains. In the future, motor cars will be affairs of convenience; or promptly scrapped. So with all machinery. Machines will be the slaves of man.

CHAPTER XX

Cities of the Future

HISTORY has little to teach us about the future of our cities. In the past, cities have not been developed, they have grown up in foolish, haphazard fashion. Sometimes founded because the site adjoined a good water supply, they have spread upwards and outwards. No one has troubled. The result is that every great town owns slums next door to palaces, filthy backyards not fifty yards from great parks, and miles of tiny homes stretching into the country, and has but little of shape or form.

It would seem that the future development of cities like London, lies in an outward direction. The usual prophecy is that all growth will be upwards and that taller and taller buildings will be erected, until countless thousands of people will live to each acre. But the size of a city is dictated entirely by the speed and facility of its transport. Many parts of what is now called "Greater London" were, only thirty years ago, "miles in the country." The idea of travelling twenty-five miles to work would have seemed ridiculous. Trains were slow and infrequent, while to-day it is possible to limit the size of a city only by the distance which can be covered in one hour. With increasingly fast electric trains, motor cars and even

aeroplanes, a very conservative estimate for this distance is thirty miles. The city of the immediate future will, therefore, probably extend for thirty miles in each direction ; that is about nine hundred square miles. When this saturation point is reached there will be other developments.

However much the speed of transport increases, it is doubtful whether the minimum time required for a short journey can be greatly reduced ; certainly it will not be lowered in proportion. When it is possible for autogyros to land on every roof, the man living ninety miles from his office will still be able to arrive within one hour of finishing breakfast, but I doubt if the very busy people of the future will want to waste all this time in travelling. The tendency may be for de-centralization, in spite of trains with local offices and portable telephones.

The rapid growth of many cities has swallowed up factories and workshops which have no reason for being in the city. Probably, the factory of the future will more often be erected in the country and self-contained communities will arise. Flats for workers will occupy all the upper stories of the factory, and meals will be served from a communal kitchen. This principle had been forecast by Bata, the " Boot King," before his death, but he doubtless referred to a peasant population turning its hand to machinery, while I am considering the mind-skilled " workers " of the future, who will demand greater luxury than any of us know to-day.

The need for " going up to town " for a cinema or theatre will have disappeared and wireless will bring

much of the entertainment required to the most remote spots. Men and women will not want to waste hours each day upon shopping, and it is possible that if dresses must be examined before purchase, enterprising store-keepers will televise mannequin parades, with running commentaries, so that the housewife will be able to buy her clothes while sitting at home. Not, perhaps, entirely an advantage.

When cities have spread outwards to the greatest convenient size, they must begin to grow upwards more rapidly. Building in the future will not be the complicated affair it is to-day, with bricks, mortar, tiles, imitations and felt. Houses will be constructed in factories, and sections of standardized pieces sent out. Thus it will be almost as easy to transport a home bodily as it now is to move furniture. "Plug points" for heating, lighting, and drainage mains, will be available along all roads, and connecting up these services with the house will be little more difficult than putting in the plug of an electric iron.

Any man taking up a type of work which involves moving nearer to another factory, will simply pack his house and furniture and re-erect it on the new site. Probably, twenty-four hours will be sufficient time for the "move in." Houses will be considered primarily from the point of view of convenience and not for their pseudo-antique value. The people of the future will be appalled to read that a wealthy man of the nineteen-twenties made it his hobby to search old country houses for lichen-covered tiles to incorporate in his own roof. They will ask why, if this queer person had an atavistic leaning towards

ancient tiles, did he not ask a manufacturer to supply a few hundred covered with synthetic moss, instead of wasting energy by poking about ruined barns or insanitary cottages? The roses over the door of a country house are supposed to compensate for its lack of drains and light, but in the future we will insist on utility first, and I doubt if there will be sympathy with someone who wants to occupy obsolete examples of architecture. Nothing has hindered the progress of building more than the absurd importance attached to Tudor, Gothic and other types. The Tudor builders chose this particular fashion because it suited the materials which were available. To-day we have iron, and other metals, synthetic stone and wood. Efficiency and materials should dictate architectural style; and gables, chimney stacks or weather cocks become obsolete. There is no smoke to go up the chimney and the radio tells you which way the wind is blowing.

Houses of the future might even be built of chromium-plated steel, lined with noise and heat-insulating material. At present, half the energy used in warming a room actually heats the air outside, because houses are not insulated. Proper regard for the laws of conduction and convection would enable one small fire to heat a whole house comfortably. No attention at all is paid to noise. The builders of the future will consider that a house which admits noise is as bad as a dwelling which admits rain. Both can be dangerous to the human body.

Only the largest structures will not be portable, and these will probably tower into the sky and dig

deep into the earth. It may be that factories will be built directly over the coal mines, the coal being reduced to oil and coke for power production long before it reaches the surface. Generating engines would be stationed in the "basement," workshops on the ground and first floors, the offices on the next three ; and sleeping quarters, restaurants or rest-rooms for the staff, above.

In the cities themselves, all roads will, of course, be entirely roofed in. Men and women will not want to run the risk of catching cold or being splashed with mud because they happen to cross the road. All streets and rooms will be lit by two sets of lamps, one providing ordinary white light and the other ultra-violet or any other radiations found necessary for health. Underground garages will be provided for every building, so that the motorist can walk straight out of his car into a lift and be shot to whatever floor he desires. Above, on the flat roof, aerial taxis will be able to land, in response to a wireless call, to carry anyone requiring them to the great aerial terminals on the fringe of the city or to their country homes. Meters will be attached to the propellers and passengers charged so much per thousand revolutions. Human nature will probably have changed, so that any question of the size of tips does not arise.

The offices of these huge buildings will be scientifically decorated to enable workers to be as comfortable as possible, the employers of the future realizing that better work results when physical conditions are not irksome. The correct temperature and humidity will be maintained by mechanical plants, sucking in

air, washing it and possibly adding a touch of ozone. Walls will be decorated according to the advice of expert psychologists, who will find that certain colours encourage certain types of work. Expert mechanics whose duties imply gazing at a fixed point, may be placed in rooms with striking patterns on the walls so that they may concentrate elsewhere during the rest pauses.

Rooms in private houses and flats will similarly be coloured according to scientific ideas, instead of with the object of exciting the envy of neighbours. Bedrooms will be arranged in a fashion which induces sleepiness instead of sleep, studios fitted for thought and so that the imagination is stimulated. The man who is "off colour" will be asked by the doctor, the shade of his bedroom wall-paper and a new colour will be prescribed.

Furniture will be made primarily for comfort and not for ornament. Chairs will be "made to measure," and this will prove of special importance in offices, where the addition of one inch to the height of the seat may add twenty words a minute to the speed of a typist. Power will be applied in every direction where it will save physical exertion. The drawers of filing cabinets, for example, will be moved in and out by the touch of a button, and the carpenter who made a chest of drawers which proved refractory would probably find himself prosecuted for incitement to crime.

The arms of the fireside chair will be covered with buttons and controls. Turning one, perhaps, will bring in a variety of different wavelengths on the

loud-speaker and television screen. Sport, education, travel, or news, will be at the command of the owner, who need not move. All telephones will consist of delicate microphones accompanied by loud-speakers, so that it will not be necessary to get up or to strain the muscles of the forearm. The man of the future will be weak, and mechanical aids to hearing quite commonplace.

Other controls will bring food and drink when required, collect any book from the shelf, turn over the pages at a rapid pace adjusted according to the reading capacity of the owner, open and close windows and doors and instruct callers that thinking is in progress. Ear-flaps will give us peace in merrie-futuristic England, and offices will contain dummies to whom old-fashioned people can talk of weather. All the time wasted in answering the front door will be saved. Touching the bell will make no sound, but a picture of the caller will be flashed upon the television screen by day or night. If he is welcome, a touch of a button will unlock the door and admit him. If he is not wanted, a loud-speaker will reply "Not at Home" or "No hawkers, canvassers and circulars." Such trifles as "turning" the light on, or warming the room, will not trouble the man of the future, for a photo-cell bridge will ensure the one being done as soon as it is necessary and a thermostat will keep all temperatures adjusted.

From the moment he finishes work to the moment he goes to bed, there will be no need for the man of the future to move from his made-to-measure chair, which will be specially designed to remove all strain

from the atrophied muscles and to give perfect relaxation. It may even be found that small electric trollies will be used for travelling from room to room.

What is generally called "housework" will be eliminated by a hundred different devices. No corners or cracks will be permitted. Rooms will be circular or oval in shape, instead of the conventional rectangle. Carvings, heavy curtains, carpets and other dust collectors will be abolished as unhygienic and wasteful. Vacuum plugs will be on every wall, so that cleansing is a matter of a moment. No ordinary machine will be used, for the noise might prove distressing. Air will be drawn in by an engine stationed underground and some germicidal chemical sprayed into the air. We shall all be much more particular about the elimination of invisible dirt. At present, a room is considered "clean" if one cannot write "dust" on the mantelpiece, but it may be brim full of deadly germs without anyone worrying.

The vital foods will be manufactured in large factories and distributed in small capsules. The bulk food will be made in communal kitchens, largely by machinery, and despatched at regular intervals to the various rooms. Men will, I hope, insist upon screens being drawn round them while they eat, and but for the influence of psychologists it is possible that a new "taboo" concerning crunching might arise with a fashion for special little closets in which the disgusting business of satisfying the demands of the stomach could be accomplished. All the paraphernalia of knives, forks, spoons, plates, silver and glass will be abolished as unnecessary and wasteful.

The terrific waste of energy occurring during the business of "washing up" will appal the scientist of the future. Even before the arrival of capsule meals, synthetic crockery, tablecloths and so on will be made from cellulose. They will be used once only and then destroyed. The present system is like rubbing out the writing on a piece of paper when you wish to write a letter, instead of taking a new sheet. The slavery of the kitchen basement in which whole lives are spent in peeling potatoes and washing greasy plates will be illegal, and "servants" as we now call them, will be as rare as are slaves to-day. The man who wishes to have three or four others devoting their whole life to his physical comforts will have to prove that he is of great value to the world; and if he is of such real moment, he probably would not want them at all. Strangely enough, it is the idlers who think they require most attention.

Synthetic linen will be manufactured so cheaply that no one will worry about washing sheets, tablecloths and towels. Beds will be equipped with electric blankets and a similar series of buttons as in the case of armchairs. A photo-cell on the window-sill will awake the sleeper at dawn or at any subsequent period he may desire, automatically draw the blinds, turn on the bath and serve a cup of tea. Another button will bring him his sterilized one-piece suit, ready to put on, and while he is dressing, the world's news will be flashed on the screen. If it is found necessary to have a "daily dozen," he will simply step into an exerciser which will massage him and put his limbs through the motions.

Family life as understood for the last few hundred years will probably disappear. It is quite artificial and founded on the need for the protection of women and children. In the future, women will have to look after themselves and the State will claim the right to govern children, on the grounds that the majority of parents are incapable of bringing them up efficiently themselves. The idea that children love their parents because they give them food and happiness will be exposed for the absurdity it is. The idea that there is always a natural bond between parent and child which should be carried all through life is a fallacy, for all animals turn their offspring out of doors as they approach maturity. In the future, the complications of family life will be increased by rejuvenation; it is probable that a son and his rejuvenated father will both fall in love with the same woman.

As he approaches more to the alleged God-like stage, man will live more and more alone, meeting his fellow creatures at comparatively rare intervals. It will be noticed that uneducated men and women, like herd-animals, cannot remain unaccompanied for long. They feel the need for wagglng their tongues while blowing air through their mouths and they want to see others performing the same silly gyrations. Business in the future will be conducted very largely by wireless and the need for masses of men to shout and bellow on the Stock Exchange will disappear. Since one man will become capable of handling more and more work with the aid of machines, there will be very few tasks that require several to perform them.

This does not mean, of course, that we shall lead hermit-like existences ; the world will contain many millions more people than it does to-day and the population will be far more dense. But it does mean that Smith will be able to keep in touch with his friends and business relations, without having to eat with them ; and that sitting in his chair, he will be able to converse with anyone.

The world's cities will probably change places very rapidly. As long as the sea was our principal avenue of transport all places situated near the coast were important and necessarily grew. But with the development of aerial transport, cities can be conveniently established anywhere as far as accessibility is concerned. In the immediate future, the world will probably centre round new places such as Ottawa, but, eventually, there is no reason why a town built in Greenland should not rank as the most important in the world ; always assuming the convenience of power supply. Not the presence of water, but power, will dictate the position of the metropolis.

Evolution from the tiny collection of mud huts to the mighty centre of the future, covering many thousands of square miles, will continue gradually. With food, clothing and power directly obtained from the sun, air or water, there is no reason why the whole of the earth's surface should not be completely covered. Man will find before long that the underground dwellings surrounding every terminus will best satisfy his craving for thrilling comfort.

CHAPTER XXI

Synthesis

DIRT has been defined as "wealth in the wrong place." A larger quantity of the coal dust which grimes your face and hands in the cellar would drive a liner across the Atlantic, and the black that gives the chimney sweep his characteristic appearance would, no doubt, make excellent printer's ink. In the future, scientists will take care not only to produce useful commodities, but also to make sure that they are correctly distributed. There are two ways of making money; earning more or saving more. While always adding to the productivity of the world, scientists will realize that there are limits in this direction, but to the technicalities of directing the various forms of matter into their proper channels, there is no end.

Boys at school are told that matter can neither be created nor destroyed. The number of atoms in the world is, more or less, constant. But the forms the atom may take up change from time to time. Carbon, hydrogen, and nitrogen, can be arranged in a million different ways with various other elements. Chemists have not yet even approached the end of such variations: every year new compounds are built up in the laboratory. The same elements may be joined together to form the gravel in your garden

path for which you pay a few pounds a ton or to form a rare medical drug, costing many hundreds of pounds for each ounce. It is no more than a matter of the grouping, arrangement and possibly speed, of the atoms in the molecule. When you read of the opening of Parliament to-day, and of the flashing jewels of Lady Boome, do you realize that these same diamonds are of identical material as the coal which, in slightly different circumstances, was dug for their payment ?

When the discovery that urea could be synthetized in the laboratory was made, a new vision was given to the world. Previously, even expert chemists had held that matter was of two kinds, organic, which was "natural," or living, and could not be prepared artificially, and inorganic, which was also found in nature, but could be made in the laboratory. Urea was the first so-called organic substance to be made in the laboratory, and chemists have now deduced that there is not a single substance which cannot be built up by "artificial" means. As soon as a new material is found in nature, attempts are made to synthetize or construct it from other and commoner chemicals. There are many compounds which are required in large quantities and which are difficult to procure from natural sources. Supplies of "nitrate," for instance, have become insufficient for the world's needs and will eventually become exhausted. But chemists have found out how to build up nitrates from air and water so that artificial manures can be synthetized more cheaply than they can be dug.

The chemist of the future will aim at bringing all

matter under his control, and putting all "dirt" in the right place so that it becomes wealth. He has already made great strides in this direction. The "dirt" which results from the heating of coal for gas lighting, for example, instead of being poured into the air to settle as fog, is now collected to form the basis of one of the most wonderful series of compounds known to us; coal tar derivatives. Waste has been turned into money by being kept from the air and formed into a hundred substances, from dyes to saccharine.

Probably, most of the foods, fuels, clothes and chemicals required by the people of the future will be synthetized from air, water, and vegetable matter. Chemists will discover a method of turning cellulose, which is indigestible and useless to man, into starch, so that a tremendous amount of time will be saved in farming. The same plants will yield food on the one hand and silk stockings on the other. Rubber, which will be one of the most vital substances to the men of the future, may be synthetized on a large scale with the aid of sunlight. This has already been achieved in the laboratory by passing a mixture of acetylene gas and hydrochloric acid gas through mercuric chloride, which acts as a catalyst; vinyl chloride being formed. Exposed to the shorter rays of sunlight in the presence of uranium salts, the vinyl chloride is converted into a rough form of rubber. Of course, such an experiment is at present tremendously expensive and some of the chemicals used cost more for an ounce than rubber does for a pound. But most original problems in synthesis are

exceedingly uneconomic and it is for the chemist, having found the method, to experiment until the commercial stage is reached.

In the synthetic factory of the future, artificial sunlight, far more realistic than the present variety, will probably be used for making many changes. Anyone who has used a camera knows that the sun's rays can produce chemical action. It is this action which makes the negative possible. In the same way, the sun acting on substances in the skin turns ergosterol into vitamin D, which is one reason why ultra-violet ray baths are beneficial in certain cases. In the future, no doubt, sunlight will be used for making this vitamin in some extremely concentrated form with the possibility of direct injection, while even chlorine under the action of sunlight can be converted to chloroform and its derivative compounds.

The process of "breaking down," which is the opposite to synthesis, will be equally useful. Rearranged, the electrons and other particles of hydrogen would give us helium. At present there is a great shortage of this gas in the world. Airships rely on natural sources, of which there are only two or three, certainly not enough to supply a fleet. The airship builders of the future will turn their hydrogen into non-inflammable helium, and one of the greatest dangers of this form of travel will be eliminated. A holiday tourist who prefers the quiet of a huge airship to the speed of a rocket will be able to travel round the world in three or four days without losing a moment's sleep in his comfortable stateroom, from fear that fire may occur at any moment.

Hundreds of years ago, chemists were almost entirely preoccupied with the problem of turning one element into another. They did not know the elements, as we do, but supposed they were fire, earth, air and water. Roughly speaking, they believed that if they could make or secure the Philosopher's Stone, it would enable them to turn lead into gold. These alchemists, of course, never found this so-called stone or converted lead into gold, although, no doubt, they performed sleight of hand tricks by flickering firelight to impress their wealthy patrons in view of further subsidy. Then, for a hundred years, these alchemists were ridiculed as men who were attempting the impossible. The word "impossible" has no place in the true scientist's vocabulary, and at last the Philosopher's Stone was discovered in the form of electricity. It would seem that by its aid the people of the future will be able to turn one element into another, although I doubt whether they will trouble to turn lead into gold. The latter metal will long since have ceased to possess any artificial value.

Transmutation involves the alteration of the constituent parts of an atom to form a new atom, as for example, the "bricks" of a helium atom rearranged give the hydrogen atom, plus something over. This "something over" is the atomic energy which for some years has been considered as a possible source of terrific power. With the problems and possibilities of harnessing such energy in the future, mankind will undoubtedly deal, but it may always remain uneconomical in relation to the final result. The wonderful possibilities of manufacturing comparatively rare

elements in this fashion has not so much been considered. If, for instance, that rare substance lithium becomes in great demand for alloys which will be needed for the flying machines of the future, chemists may find a way of breaking up the constituent parts of the sodium atom, which is closely allied to it, and, by rearrangement, produce lithium. Any energy left over would be an exceedingly useful by-product, if it were found capable of being harnessed.

The substances and elements in demand one hundred years hence will probably be quite different from those most prized to-day. Once a metal is produced in sufficient quantities, it is surprising how many uses can be found. Chromium, for example, for many years after its discovery was merely a chemical curiosity. Now it has proved the saving grace of iron, a metal which in many ways is unsuitable for so many of its common duties. Paint has been called "iron's badge of failure," the symbol of its susceptibility to rust. Chromium may take the place of paint, and restore iron to its position as the most useful metal known to the world.

Iridium is another element, still tremendously expensive, but no longer a chemical curiosity, as it is to be found on most sets of false teeth, in many pieces of jewellery, and on the tip of every fountain-pen nib. Could we discover some method of producing it more cheaply, as the chemists of the future most certainly will, it could be given a thousand odd jobs. A motor car with an iridium body might cost a million pounds to-day. In the future, this very hard, but easily worked, metal may be the usual thing for cars.

It is probable that new inventions will create a demand for elements and metals now regarded as useless. Sulphur, to take one instance, figured only in small quantities in the medicine chest, where it is associated with treacle, until wireless arrived. Then it was found that the substance made by combining sulphur with other compounds was ideal for such things as control panels, acoustic horns, and a thousand other oddments from shampoos to table tops. It remains for the chemist of the future to discover useful applications of silicon, at present unemployed, and still the second commonest element in the world. It would be possible to multiply instances of this kind almost indefinitely, but we may take it that future chemists will regard an unemployed element or compound in the same way as we regard an unemployed man, as an example of tragic waste.

There may even be an unemployment bureau for elements or compounds, and those in charge will have the task of finding jobs for them. The manufacturer will say, in effect, I can produce so many tons of beryllium per month at a comparatively small cost. What can I do with it? The chemists will carefully examine all the properties of beryllium and eventually find that it is ideal for a certain part of an engine when alloyed with other metals.

There will no longer be "rare" metals. Some will be rather more expensive than others owing to the difficulties of transmuting them, but no metal or alloy will be so scarce that the engineer will be unable to make free use of it where it is best suited, and the medical man will prescribe any compound,

knowing that the chemist can provide it in sufficient quantities. Substances like gold and silver will not be prized for their rarity by other than fools.

There will be little waste in the far future. Apart from the fact that it will be better realized that waste means work which is unnecessary, both in making the waste and in its destruction, the increasing requirements of a rapidly-growing world population will demand that better use must be made of everything. Even to-day, the rags, waste paper and straw, which were thrown away by our grandmothers, are being used ; sometimes wastefully in incinerators to create power, sometimes more usefully to make power alcohol for engine fuel. Gramophone records are made from milk which at one time was thrown away, and even the pips extracted by wine presses have been caused to yield a lubricating oil. The silver paper which used to litter the streets is now melted down, with benefit to the hospitals and metal merchant alike. I cite these as but a few examples of what can be done by chemical economy.

The big communal kitchen of the future will eliminate the tremendous losses at present implied by the collection and destruction of household rubbish. Millions of calories of potential heat are dumped into the ocean every year, and, although it is true that they may eventually return through the cycle of life to land as fish, the process is unnecessarily wasteful. The world's loss of phosphates is so serious that even now many chemists are predicting a phosphate famine which would have most serious results where crops are concerned. Probably, in the future, some

definite method of retaining this waste, when vegetable matter is destroyed, will be discovered and governments insist on preservation of this valuable matter. The courts of the future may deal with men who waste phosphates as those of the present fine the thief of some electricity, valued at one penny, by obtaining a telephone call without payment.

Prophecies of world shortages have frequently been made in the past, but always the chemist has come to the rescue. Thirty odd years ago, Sir William Crookes warned the British Association very seriously that the depletion of the nitrate resources of the world would lead to wheat famine. Chemists set to work on the conversion of nitrogen from the air, and now, well over one million tons of nitrate are made synthetically every year. In the future, it will probably not be worth while digging up the nitrate at all by, then, antiquated methods.

As a rule, we regard the air only as something to breathe, something without which life cannot exist. The people of the future will know that it is even more important, for they will depend upon it not only for oxygen, but also for fuel, food, clothing, and even for materials which are little better than unexplained mysteries in our time.

Once a method of turning the carbon dioxide of the air into coal or some other combustible substance is discovered, those who live in the far future will be able to "short circuit" nature and perform in the laboratory a task which it takes nature many thousands of years to complete. The chemist's workshop can turn carbon dioxide into methane. In years

to come, many "oil wells" will be huge plants for converting the methane produced from the air into acetylene, by means of the arc oven. The acetylene will be made into tar which will yield oils suitable for working heavy motors. This is the same process which takes place, over thousands of years, when vegetable matter becomes coal.

It is not sufficiently realized that waste has to be paid for. When, a hundred years ago, Britain, France and Germany indulged in a very expensive series of wars, there was tremendous waste. The discovery that coal could be made to produce wealth resulted in payment for that war being available. The next war may be fought in the laboratory. In the process of synthesis the chemist has a bigger weapon for the struggle, in its broadest sense, than the miner with his pick. At present, there is still prejudice against articles produced "artificially," so that many people insist upon the "real thing."

In some cases, as, for example, medicine, it is possible that the natural product is the best. This may be due to the action of ultra-violet rays or other vibrations found in nature. In the future, the rays themselves will be produced synthetically and the products subjected to their attack. It is quite possible that the presence of small natural impurities may be helpful. Quinine prepared from cinchona, for instance, contains other chemicals. In the future, the chemist will add these "impurities" if they are found to be beneficial.

But the idea that synthetic products are "different" is foolish. There is no intrinsic difference

between the pure cane sugar made in the laboratory and the pure cane sugar produced from vegetables. Synthetic silk is still, perhaps, not as strong as natural silk, but it is probably far superior to the first silk spun by men. In a few years the epoch-making discovery of "ladderless" stockings will surely be made by man.

The great benefit which synthesis confers upon us is that of international wealth, which in its turn means release from mechanical labour. Until comparatively recently, many drugs such as quinine were rare and expensive. Now, both quinine and aspirin are within the reach of the poorest when required. Silk stockings, which were once a sign of nobility, are now worn by girls earning only a few shillings a week. The chemist, if the Socialists and Communists did but know it, will prove the greatest leveller of all. When there is enough of everything for everyone, no one will want to be rich.

We cannot overlook the possibility of synthetic life. The idea that something "living" could be produced in a test tube with electricity from "dead" substances has fascinated many chemists. Indeed, not a few have claimed to have achieved this act of creation and made "live" matter out of "dead." The subject has been rather suspect since a German chemist was stated to have produced living things, which on microscopic examination proved to be minute drops of oil, moving by capillary action.

It is quite possible that in the future, "life" of a very low kind will be produced artificially in the laboratory. The problem does not seem very

extensive. We can analyze living matter and find exactly what chemicals it contains. The problem is to take the chemicals and give them life. Synthetic quinine as good as any other has been manufactured, but this is a very different thing from making cinchona which will grow, eat, and live. So it is with higher forms of life. The human body is, we know, just a few pints of water, a few ounces of carbon and a dash of other elements. But given all the requisites, no modern chemist would be so foolish as to attempt to construct a living man !

One of the great difficulties in discussing this subject is to arrive at a satisfactory definition of "life." It seems easy enough ; something which moves, eats and reproduces. Between the very simplest cells and inert matter there is little difference. Yet it is this difference between "life" and "deadness." A very passable likeness to a cell can be made by the chemist, but it will not live. Once the simple cell could be made, it would be possible to build up larger organisms. The human body itself is only millions of small cells, linked together by a wonderful use of the laws of mechanics. Placed end to end these cells would reach round the world, so that the chemist of the future who sets out to manufacture a living being after the manner of Frankenstein has a pretty task ! It is not right to use the word "impossible" when referring to the remote future, but I would say it is improbable that chemists, for many billions of years, will ever try to make one of the larger living creatures in the laboratory. Even with a mass-production machine for turning out

living cells, the task would occupy a lifetime, and it would be much cheaper to subsidize motherhood !

But if the method of making simple cells, probably by invigorating the elements with electricity or some particular form of vibration, is discovered, it may be utilized for producing foodstuffs, and especially green vegetables. The synthetic farm of the distant future will take in at one door masses of chalk, water, phosphorus, and a few other elements, while out of the other door will pass synthetic cabbages and synthetic peas.

Life is far more than a chemist's mind alone can conceive. We have, as yet, not the faintest knowledge as to the nature of the materials which are essential to life. Chemists will produce tabloids containing, it seems, all the necessary ingredients of food. But the mechanism of the body has to be worked by mere useless volume and it has to be reconstructed to allow for wear. In the same fashion will the scientist approach the " construction of life " without realizing that, if all matter is living, it will be impossible to commence with materials which are dead.

I do not credit, on these grounds, that absolute sterilization can occur, and I believe that the human frame will be built from a mixed collection of bodies by the surgeon, glands inserted and artificial characters produced, long before the monster of fiction has its chance. It would be so far more difficult to complain of the result, and so very much easier to cast the blame upon the Creator of original matter as the only Being of which our children's children must remain in utter ignorance.

CHAPTER XXII

Government

FOR the last hundred years, Government has been conducted in most countries on the principle that two heads are better than one and 395 far better than 394. This is, of course, a logical fallacy, for the statement pays no regard to the quality of the "heads" and the purpose for which they are required. No good reason can be found for having six hundred odd men and women to discuss whether husbands should be responsible for their wives after death; indeed, the subject would be better left to a committee of spiritualists and lawyers, so that Members of Parliament could escape the accusation that they were turning the best night club in the world into a henpecked mothers' meeting.

I doubt if six hundred men will always be willing to sell their souls for as much as four hundred pounds a year, because money and souls will be appreciated at their true value. Further, it will be quite unnecessary to have representatives to deal with important subjects. If it is considered advisable, a plebiscite can be taken with very much less trouble than is now expended upon the House dividing, meeting again, talking and dividing once more. A system of totalisers with electric buttons in every post office would

make it possible for men and women to register their votes with the minimum of difficulty. Each voter would carry a card, which, when inserted in a slot, would enable him to vote, only once. Any attempt to use the card a second time would result in the previous vote being automatically cancelled, for it is obvious that criminals are not fit to exercise the franchise.

The House of Commons, instead of being a social meeting place, would be a gigantic calculating machine. As the votes were registered all over the country, calculators would add them up and deliver the result in a few seconds. Two or three men to oil and keep the machines in order would be sufficient, and the balance of man power would be able to devote to useful work the energy now wasted in agitating the larynx.

It is possible that before Government is conducted in this way, an ingenious engineer will harness the energy now wasted on the air and that the "debates" of the Commons will be turned into electricity for illuminating the chamber. Care would have to be taken, of course, to insert fuses so that the lights would not waste during exciting scenes such as seizing the mace or stating that the paradoxically honourable member for Little Muggledon had spoken a terminological inexactitude.

Politicians may discover in the near future that truth is rarely revealed by discussion. Priestley did not find oxygen by arguing about the nature of air, but by examining it, and Sir Ronald Ross would certainly never have segregated malaria parasites

in the stomach of a mosquito by waxing oratorical over the possibility of their being present. The methods of science must shortly be applied to Government, and instead of debating the subject of unprofitable coal mines, members will investigate it in detail. They will realize that in a properly governed state a cut of one penny in miner's wages will make little difference, and that the advantage gained by maintaining children at school for one year more can hardly be measured. Application of scientific methods would enable such wages to be raised by one pound and children to be kept at school until they were twenty-one. But one must go with the other. It is no good teaching your child to use his brain and then refusing him the opportunity of doing so. While the work of machines is foolishly done by men, the only sensible course is to educate men like machines.

In the near future, the terrific waste of time involved in six hundred members getting out of their seats and walking through narrow passages to be counted like sheep will be stopped. Even to-day, big manufacturers count the packages turned out of their factories by the invisible beam and there is now no need for any member to leave his seat at all. A boy could arrange an electrical apparatus so that by pressing alternative buttons in front of his seat a member could say "Yea" or "Nay." Even more time could be saved by members staying at home, having their telephones inter-connected and listening to dull speeches while reading the evening paper in an armchair. Votes would be cast electrically, and

the chamber of the House would make a very suitable telephone exchange. Night sessions would probably become fashionable and, no doubt, so that members who had gone to bed might turn out, the whips would arrange for a buzzer to awake them in time to cast their votes.

Government is, at present, hide-bound by tradition ; it is not even possible to make a Bill law in the language of the people. The words used by kings five centuries ago, when French was considered fashionable, are still good enough for the House of Commons, and, logically, debates should be carried out in the same language. Why "The King wishes it" should be spoken in French to-day because it was the expression used by Edward the Third or some other long-dead gentleman, I cannot understand. The position would be more tenable if the traditional remarks of Edward III on hearing that the Commons had decided to cut his allowance were also repeated ! The whole idea of form or precedent in government is wrong. It disguises sloth and ignorance. In the future, a real attempt will be made to apply scientific principles to one of the most important studies of the world. As it is, the fate of the nation may depend on a man knowing whether he should, or should not, wear a hat when rising to ask a question.

There are many who praise the fine traditions of Government in Britain, and say they will last in the future. But whenever I hear traditions praised for themselves, I cannot help feeling that it is because there is nothing else to admire. The habit of the Government of storing Exchequer tally sticks many

hundreds of years out of date resulted in the Houses of Parliament being burned down one hundred years ago. The habit of hoarding traditions may have the same result again, for a very different reason !

Members of the House are drawn from every profession, but very, very few are scientists. Yet the Government is dictating, in matters of science, to an increasing degree. The House decides what speed is safe for a motorist. This is not a matter of opinion, but of science ; and why an ex-miner, a chartered accountant, a clergyman and ten bishops should be considered fit to give an opinion on the subject is difficult to understand. Obviously, it is a question to be ascertained by a small group of technicians, who would carry out tests upon the reaction speed of typical drivers and by means of graphs discover the maximum safe speed for certain makes of cars on specific roads. The House of Commons, knowing nothing about the matter at all, originally decided that the same speed should be maintained on country lanes—built for horse and cart—as on arterial roads. That a remedy has been found, establishes the value of public opinion when expressed in the form of mass voting.

Six hundred lawyers, railwaymen, accountants and company directors have made laws for coal mines, and the results they have achieved are the strongest argument for scientific matters being decided by scientific men. In the future, a large number of details now considered to be of political interest will be dealt with by experts who will examine each case on its merits, instead of its vote-catching ability. At

present, a Government may lose office because it believes in a strong hand in China and because its opponents immediately reverse all policies as a matter of principle. Thus we may well have scientific research upon the use of low temperature coal cancelled, because the majority of people think that China should be left to look after itself !

Government at present has not even the advantage of being truly representative. A man can be elected to carry out a certain programme, and then do his best in the opposite direction. For five years those who elected him are powerless to do anything. Obviously, a great deal of time and energy could be saved if all votes were cast in advance, so that when a Member made a promise to vote in a certain way, the calculators could "chalk him up." Having won his election, there would be no further need for him to worry about any attendances for another five years.

Probably, in the future, no man or woman who is unqualified for a degree in science will be counted eligible for election to Parliament. There is only one end to all arguments ; scientific experiment and deduction. Whether a certain policy will have a certain effect is not a matter for debate, but for reference to experts. Just imagine two ignorant men arguing as to whether a ton of T.N.T. would or would not explode when a match was applied to its local detonator !

In the future, some enterprising politician may start a party for "the Abolition of Ancient Laws." Parliament has been making laws for centuries, and has spent very little time in unmaking them. Thus

we have the absurdity of someone discovering a law made by Henry VIIIth in a fit of temper, and applying it to a harmless tradesman, or Members voting for the illegality of sweepstakes, with filled-in coupons tucked away in their waistcoat pockets. In the future, those elected will probably be made to act according to their votes, and anyone found not attending Church after voting for the closing of cinemas on Sundays, will then be detained during His Majesty's pleasure. They will use, perhaps, this traditional phrase.

Looking into the far future, it is not difficult to see the time when the Prime Minister will be one of the least important people in the country. The real work of ensuring health, wealth, and wisdom for the people will be carried out by permanent officials, while the Prime Minister will have to worry about nothing except outside policy such as dealing with refractory Martians or overcrowding in the æther. It is difficult, indeed, to think of a single political problem of the future which could be solved without reference to scientific data. The control of inter-planetary traffic is a matter for astronomers and not for men who think that gravity means a serious countenance, and the advisability of harnessing the tides could only be decided by expert evidence concerning the effect of the moon. If problems like the control of motor traffic, the building of railways, farming and shipping, had been left to men who understood their subjects, we should not be fifty years behind the times. As it is, an unfortunate system of control means that inefficiency must be bolstered for just

as long as those responsible have votes in their treasury.

The Government of the future will deal very severely with values. They will not allow a motorist to run over a child for ten pounds one day and buy an old picture for ten thousand on the next. Nor will they allow the woman who sells herself in the streets to be imprisoned while the men who buy her wares go free. The politics of the future will be a scientific religion, for it is obvious that if the dictates of truth and religion were observed, there would be no need for policemen, law courts, or prisons. Many of our daily customs only endure because we are so ignorant of conditions in other lands.

The extent to which socialism will spread in the centuries to come will astonish those, could they live to see it, who to-day preach a very narrow creed of State ownership. It is clear that our increasing interdependence upon each other implies that we must have control, and no one has ever found any other method than by the State. We shall have, not only State nurseries, State power houses, and State roads, but also State weather, State gland-operating theatres and State news-tellers. Many of those things which are considered of prime interest to the Government of to-day will not matter. The Army, the Navy and the Air Force, for example, may again become the hobbies of a few millionaires. It is certain that no sensible person will waste time and money on them unless the most tangible benefits are received. On the other hand, it is obvious that we shall want to have control over our own weather and to make sure

that our power and light sources are not cut off at a moment's notice by a species of commercial blackmail. Any worker in a public service who attempts to hold up the community will be treated as a mutineer in the Army, but no one man who is fortunate enough to have someone else discover that there is coal under his house will be able to draw royalties from it for the rest of his life.

The disappearance, by education, of the idea that money is in itself a desirable commodity will, of course, result in the dying of the foolish party politics system as it is now understood. There may be parties. Perhaps they will consist of those who believe that the world will end in a thousand years, on the one side, and those who believe it will end in a million, on the other. An opinion as to the date of this occurrence is of vastly greater importance in politics than whether you are poor and think you ought to be rich, or rich and think you ought to remain rich. One party will believe in making the greatest immediate use of the world's resources without reference to the future. The others will try to see the end of any new measures introduced, before proceeding to establish their committees.

Most people, when dealing with the politics of the future, cannot resist the temptation to talk of a woman Prime Minister and a Speaker in skirts. It is, in one way, quite natural to suppose that women will occupy high Governmental posts, just as they will hold important positions in Industry and Science. But long before this period arrives, we shall have ceased to talk of "women stockbrokers," or "women

M.P.'s." While a male politician is simply "a Member," and the female is a "woman M.P. who wore a striking toque," there is no possibility of a woman becoming Prime Minister. Unless, of course, all men suddenly become so wise that they acknowledge politics to be *démodé*. Women, in Parliament and outside, have yet to realize that what they think is more important than what they look like and they have to learn to be creative in thought as well as in body. Here men have the advantage of centuries of hereditary influence, and although few politicians are allowed to think for themselves, some are still capable of this process. Women have not yet been sufficiently educated to view matters of importance from other than a very personal angle and in the majority of cases they have merely trodden paths already made easy by men.

It was not the Suffrage Bill which gave women freedom. I doubt if their voting has made the slightest difference to the country, for a clever woman could always influence her husband and the foolish vote is always inevitably wasted. It was the inventor who gave woman her "freedom." He made the vacuum-cleaner, electric fires, and a thousand labour-saving devices which have rescued women from the slavery of housework. What man cannot yet do is to teach the gentle sex any theory of spare time or to solve the problem of physical liabilities.

The future of women in politics, indeed in the world, depends upon what they do with this time, presented by chivalry to be used as they will. Clothes and the local café will not help them to learn that

freedom is a thing which cannot be given. It must be earned. The slave may be released by his master, but he has to discover how to be free and it is a process requiring imagination. When people forget to say : " Isn't it wonderful, a woman has flown to Australia ! " and say : " Isn't it wonderful, a woman has designed a machine which has flown one yard," I shall believe that the triumph of female progress has been achieved. I am not surprised when I read that a woman has swum the Channel. It is just the kind of thing a woman would do. When I am told that one of these creatures has crossed the Channel on a boat driven by a sun-power engine of her own invention, I shall be more interested.

In the far future, of course, the House of Commons will be of no more importance than a vestry meeting. Once upon a time parish councils were of great importance. We were only interested in our immediate neighbours. Gradually the range became bigger and bigger. The parish gave way to the county and the county to the country and the country to the Empire. Eventually, the whole world must be governed by a single hand. More and more problems require international consideration. I do not suggest that the League of Nations will eventually serve the world, but that we will realize the folly of barbed wire frontiers and tariffs. It is not until thinking people grasp the lunacy of encouraging tinpot nations to ape world status that world-wide government can be attained. Some will say that patriotism will have disappeared and a fine incentive to progress and sacrifice have been lost. But the greatest progress and

the greatest sacrifices have always been made in the name of humanity as a whole and not for a select band who chance to speak the same language or eat the same food. Lister, Pasteur, Faraday, or Darwin did not work for the honour of his country, but for the human race. With our present state of evolution, a narrow form of inspiration is required for the majority of people, just as a thousand years ago many a man would lay down his life for his feudal overlord who cared not one tinker's curse for his country.

It may be that an invasion from one of the other planets will be the motive force to drive the whole world together. More probably, it will be the march of progress demanding a fair distribution of the world's resources so that we avoid the farce of fed but naked men in one country and over-clothed but hungry men in the next. Perhaps, a thousand years hence, cheap trips to view the House of Commons will be run from Greenland. "In these little huts," the guide will say, "some six hundred men used to sit taking off and putting on a strange article called a hat. They also marched solemnly in and out of doors, shouting 'Aye' and 'No.'" It is believed that they used to discuss legislation, but, apparently, they were only interested in a little district known as England, over which we passed on our way, and what they said is of no importance. Scientific progress was just beginning at that time."

CHAPTER XXIII

The End of it All

HOW will it end? This is, perhaps, the most natural question to enter the mind after any logical consideration of the future. That the end of the world can only refer to this little fragment of the universe and that there must be some conclusion to the activities of our race, is usually taken for granted.

The metaphysician will be tempted to speculate upon the need for this "fight to a finish." Men used to hold that all things must have a beginning or an end; all things, that is, but the Deity, who was eternal and infinite. Einstein has demonstrated mathematically that infinity is, paradoxically, a measurable length; he has even given the length of infinity in round figures of light years. Time is a more vital and elusive dimension than length. Space and time are related, although exactly in what way we cannot agree, for the human mind cannot conceive the possibility of absolute creation. Those optimistic poets who wrote the book of Genesis had to postulate the existence of a God before the making of the world. So we cannot grasp a time without end.

But I believe that succeeding generations will be much intrigued by the apparently inevitable end of the world; more important still, the end of the

universe, of everything. During the last fifty years opinion has changed. We have rejected the literal meaning of the "Last Trump," and we realize that the pictures we were shown as children, of the Heavens, very cloudy, being divided by an invisible hand, with unpleasantly human angels appearing with "The Book," have only mild metaphorical interest. We have realized that matter is indestructible. It can be changed into energy, but never destroyed. According to present knowledge, therefore, the world could not end. It could only alter its form. This may not be much consolation, but it is a solemn thought that millions of years hence, the atoms or "vibrations" which make up your body will still lie upon this earth in some form, even if this planet has had the misfortune to collide with a giant star and nothing remains but a fiery mass.

It is very easy to be lost in astro-physical speculation of this kind. Expanding or contracting universes both make sense. For most of us the end of the world means, literally, the ending of life on the globe. Many attempts have been made to calculate the exact date at which such an event might occur. More than once, superstitious people have prayed for days continuously in view of the approaching calamity "prophesied" by men and women who were sure that the shape of the pyramids, the number of words in the Bible, or the ravings of a demented garu, were more reliable than carefully gathered scientific data. Few scientists can resist the temptation to forecast the "how and when" of the world's end, but they acknowledge that it is somewhat fortuitous. Even though

it may be founded on carefully ascertained facts, and logically built up, step by step, any such theory must remain, like insurance, subject to the act of God or nature.

Unfortunately, most scientists who forecast the circumstances of some ending, happy or otherwise, are apt to be obsessed with their own particular branch of study. The astronomer sees some terrific catastrophe in space, in which the earth is turned into dust ; the biologist, the growth of some new organism which swallows up mankind and eventually makes the earth as desolate as it was 1,000,000,000 years ago ; the geologist, the cracking of the earth's crust or the eruption of a thousand gigantic volcanoes ; and the sociologist, the crushing of man by the machines he has made. Surely, these theories ought to be considered for the benefit of our children's children whom we cheerfully expect to be swallowed up in this dramatic fashion ?

First of all, the collision theory. There are various heavenly bodies which from time to time excite great interest by reason of their near approach to the earth. It was thought by some that the newly-discovered planet Eros would collide with us in 1931, but, as a matter of fact, it missed by some millions of miles. Of the result of a collision with a body like Eros, which is exceedingly small compared with the earth, there can be no doubt. Civilization, for many hundreds of miles without the striking point, would be wiped out. Possibly, the terrific force of the collision would shake the earth so much that unlimited volcanic eruptions would occur. We all live

on a pudding, still hot in the middle. If the planet fell in an ocean, the resulting tidal wave might destroy whole communities. But I cannot credit that such a collision will end this world. Several new minor planets or asteroids have been discovered in the solar system during the last few years, and collision with those as yet undiscovered, whose paths are uncharted, is a possibility we cannot overlook. There is consolation in the fact that most heavenly bodies move in regular orbits and as the earth has not been struck, as far as we know, for millions of years, it is unlikely that an "accident" will occur with anything in the solar system. Even if it does, and although the results may be catastrophic from the point of view of civilization, they need not be fatal to the human race.

The results of striking some substance outside the solar system would be more terrible, and would probably end in the disintegration of the earth, with the complete reduction of all matter to dust or even to energy. If the interpretation of certain phenomena observed through gigantic telescopes is correct, such collisions are taking place every year in space. Sometimes a fixed star is seen to glow with greater light than usual, to swell, or then to contract again and become comparatively dark. It is believed that this is due to collision with another star, the terrific heat caused by friction reducing most of the normal matter to gas.

This is a possibility we must face. Fiction writers have made use of it many times, picturing the panic of the inhabitants of the earth as the star approaches nearer and nearer. They have overlooked the fact

that we should probably have a very long warning of the impending irritation. It is possible, if the world does end in this way, that two or three generations will be born, grow up and die between the issue of the warning by astronomers and the eventual catastrophe. The nearest fixed star is between 24 and 26 billion miles distant and the next nearest, 40 billions away. When we come to the vast majority of fixed stars, we have to talk in "light years," the distance that light, of which the speed is about 176,000 miles a second, travels in a year, and we soon reach the hundreds and even thousands of light years. The terrific impact in space which causes the brightness observed in our modern telescopes, actually took place a thousand years ago! It is possible that if a "collision warning" were issued in a hundred years' time, the catastrophe being expected to take place in a further one hundred years, our followers on this earth would take it far more seriously than the majority of people of to-day. We still pay more attention to some calculation which is supposed to be based on the wisdom of an Egyptian magician who died two thousand years ago than we do of a modern scientist, and many would rather pin their faith to a mascot which had been dipped in a wishing well than to scientific instruments.

Our children will have been brought up to think scientifically and they will probably, with the strong urge to preserve themselves, immediately take steps to ensure the emigration, at least of a small part of the human race, to another planet. Their children rescued, many millions of miles away; those who were

unable to escape would face the end with equanimity, knowing that they had provided more effectively for the future than if they had spent the passing years in praying and burning incense. To help oneself is an injunction which, presumably, was given intentionally !

Another theory, again popular with novelists, is that the tail of some comet will envelop the earth and wipe out every living thing. This, indeed, was actually prophesied when Halley's comet appeared in 1910, and in some parts of the world, people shut themselves up in their houses, in order to avoid contact with the poisonous gases which it was supposed would pollute the atmosphere. In spite of the magnificent spectacle the earth was in no real danger, and there is no evidence that any wisp of the supposedly poisonous tail reached the earth.

It is by no means certain that contact with a large comet would be fatal to the earth or to its life. The tail of a comet consists of very finely-divided matter and, although a "bull's eye" might have a devastating effect, mere contact might be unpleasant, but by no means fatal, especially at future times when men will be better equipped to resist such dangers.

It seems, then, that the earth having avoided collision—it cannot be by chance—for so many million years, may be reasonably safe for an equally long period. It is a matter of chance—the name we give to laws which we do not fully understand. The position has been compared to four men each kicking a football about in a playing-field of 50,000 square miles. Two of the footballs *might* collide, but the

chances would be very remote. Nevertheless, as long as the four footballs were moving in the limited space, however big, the chance of collision would always remain. Notice that the men would be quite ignorant of the existence of each other. Their impressions would be relative.

Another theory is based on very intricate mathematical and astronomical calculations concerning the nature of the universe. Scientists have held that the universe is expanding like a soap bubble and will inevitably burst. The theory is interesting, but too complicated to speculate upon, for it is a theory based on theories, and no man could say exactly what this "bursting" of the universe would resemble. Again, it has been pointed out that not only is the earth revolving round the sun, but also the whole universe is proceeding through space at great speed, taking us to uncharted lands. Anyone who understands the basis of Einstein's theory of relativity will appreciate the difficulty of measuring this progress of the whole universe through space, without any fixed point by which to take, so to speak, "bearings." But we do know that the nearest fixed star is approaching us at a rate of 40 miles per second and that the sun is receding at 18 miles per second. This gives a net speed of 22 miles per second to the star, and it is obvious, that if things continue exactly as they are, the solar system will one day find itself in quite another part of the universe. Our astronomical calculations, unfortunately, are based on a comparatively far too short period of time to state anything with certainty.

The sun is a fire, and according to our present knowledge, must, like all fires, one day die down. When the sun cools, the earth will inevitably become a lifeless mummy, for the sun, 90,000,000 miles away, is the heart of the earth, pumping life blood in the shape of æther movement on to the earth's surface and making life possible. The dying of the sun theory seems the most logical of them all. There is, in fact, no doubt, that accidents permitting, the end of this world as we know it, will come very gradually through the cooling of the sun. The question is not, therefore, so much "How?" but "When?"

According to many, a million years would be a fair period to assign to the life of the sun. After that, the earth will begin to die, and, with a surface temperature 200 degrees colder than the lowest temperature now experienced at the poles, pass into a frozen state. Few scientists are agreed about the sun's expectation of life. Some assert that the yellow flames are those that follow after white heat, others that they are the flames that precede white heat. A million years is probably a pessimistic estimate, but, nevertheless, it suggests a definite end to the type of life which we assess as human.

It is a solemn thought we may have to face, that one day, even if it be a million years hence, our children will look at the sky and see its heart weakening. It would be no sudden death, but a long-drawn decay. Hundreds of generations of men will witness it in varying stages. Perhaps one hundred thousand years before the end, we will begin to burrow, using artificial or induced means of heating as the winters become

more terrible. We would, of course, concentrate at the tropics, and the problems of over-population, if they have not been already solved, will become acute. A war to end war, to make room for survivors, may result in the entire destruction of the race. But a few may survive, and after some hundreds of generations the last men on the earth will gaze over a desolate desert, ice-bound and barren, realizing that the end has come, that the magnificent saga which began with the first coming of sentient life to matter is about to end. To end after millions of years, during which life passed through countless thousands of stages, from simple polyp to crafty fish, from fish to animal, animal to man, and man to brain.

It is for a poet, this end. But, as I view it, the twilight of the human race is no fact. I feel that there can be no real end, unless it should leave man still triumphant. Surely, he will master some secret of the power of thought over matter which will enable him to survive such physical trifles as a fall in temperature of 300 degrees? To me, it is far more logical than a theory of trumpets and clouds. It may be that nature has nicely calculated matters so that the energy of the sun will disappear exactly when one mission, the support of physical life, is accomplished and when men will be independent of body. It is a very, very long march the human race has before it, but, if we believe in ultimate triumph, we must realize that the puling infancy of civilization has yet to be passed.

The theory of the dying sun seems so certain, if accidents are excluded, but it has many rivals. Supporters

of other theories say that there will be no life on the earth long before the sun begins to die. Some geologists incline to the view that another Ice Age will envelop the surface of the globe. If this aspect, based upon our knowledge of previous ice ages, is correct, the effects are periodic, and the next is due in about 100,000 years. But I think most will agree that this is speculation rather than prophecy, and although there may be some unknown eccentricity in the movement of the earth, which results in ice ages at intervals of many hundreds of thousands of years, it is by no means certain that a temporary loss of temperature would mean the end of all things. I imagine that ample warning of the approaching cold could be given, so that men of 50,000 years hence would immediately take steps to minimize all discomfort.

By that time there will be no "nations" or "countries." The world will be one political or economic unit, and a select committee will be appointed to make recommendations. Possibly, gigantic isolation shelters will be built, and for many years all surplus heat stored for release as the ice approaches. No doubt, parents will, by exposing their children to a greater and greater degree of cold, gradually immunize them to low temperatures. The next generation, of course, will be even more accustomed to cold, and thus it will be possible for man, although a very different creature from that we know, to survive the change.

Another possibility which has been suggested, although no definite date can be given, is that we

shall be destroyed by giant volcanoes. We know that the earth consists of a hard crust over a molten or viscous interior. Sometimes, when the internal load becomes too great, or when water trickles through and is turned into steam at great pressure, an explosion occurs and a large surface eruption takes place. Those who put forward the volcanic theory of the end of the earth assume that, as the cooling process continues, the strain imposed upon the crust will become greater and greater. They point out that during a period of heavy rain, a weight of water running into millions of tons falls on a few square miles, and suggest that the constant wear and tear will eventually reduce the resistance of the outer layers.

Further, they point to the craters in the moon and speak of "the mummy at the feast." They take it for granted that the moon was once like the earth, but, being smaller, cooled more rapidly, and that the gigantic "spots" on its surface, which can be seen with even a moderately-powered telescope, are volcanic craters. Some of these marks are hundreds of miles in diameter, and, if, in fact, they are craters of extinct volcanoes, they tell a story of terrible destruction. The largest volcano on earth cannot compare in size with hundreds of these craters which are to be seen on the moon.

All arguments that are advanced in this direction are possible. But it is by no means certain that the great cavities on the moon which we call craters are really those of extinct volcanoes. Some would have us believe that these hollows were caused in the

bombardment of the moon by a gigantic shower of meteors, others that they are natural surface marks produced by normal cooling long before reaching the present stage of the earth. I do not think there is a serious probability of the earth ending in this way, although the effect of gravitational pull is greater than generally realized. We can realize the moon's pull by the tides of the sea. Few people know that the "solid" earth also responds, and that there are tides on land. But this is interesting from the point of view of the collision, rather than the volcanic, theory. It suggests that it would not be necessary for another planet or star to collide with the earth. A body of sufficient size might tear the earth into pieces as it passed a million miles away.

A very interesting collection of theories have been evolved by the sociologists, but I think careful examination will show that they are satirical rather than scientific; produced rather with the idea of teaching modern men a lesson than of seriously predicting the end of the world. Our children's children will have appreciated the point long ago, so I do not believe that mere folly can destroy the earth.

One of the most ingenious theories, less probable than that of the world's bacteriological suicide, is that which suggests the end of the world being brought about by the harnessing of tides. It may be that, in time, the tremendous power represented by the tidal wave which travels twice round the earth every twenty-four hours will be used. It is pointed out that the tides are a natural brake, acting on the earth as it spins, and regulating its speed. If this

brake is seriously altered, the effect will be for the earth to rotate more rapidly. One visualizes a graphic picture of the day representing a week, and a week compassing the time of a month in our present tides. The tidal wave would rise to the terrific height of seven hundred feet, and a month's day would be followed by one month's night. And then the end would come. The moon, instead of receding from the earth year by year as it does now, would gradually draw closer, until such time as its gravitational pull became so great that it would disintegrate. The surface of the earth would be bombarded with fragments, all life would be destroyed, and the earth would become as desolate as its own satellite. Eventually, the pieces of the moon might form a ring round the earth, very much like the rings which now surround Saturn.

It is fair, perhaps, to point out that opposing reactions may occur and that such hectic events do not imply the end of the human race. Ample warning of the "tidal peril" would be given by scientists. They would, as now, be disregarded by politicians, but the more intellectual members of the community would take immediate steps to carry on by booking seats on the interplanetary express. I think the main object of this ingenious theory is to indicate the uselessness of scientific invention without morality ; based upon the idea that the vast majority of men and women are sufficiently foolish to do whatever pleases them or saves them trouble, as long as they themselves do not suffer. It is an attitude which results in mental degenerates begetting children,

in the spread of disease, and in the making of profits alone from labour-saving inventions.

I am more optimistic about the human race, for I believe that our descendants will look to the future before all else and discover some other source of power, rather than risk oblivion within a space of 100,000 years. If a warning against unlimited tidal power were issued to-day, I agree it would go unheeded. Governments would scramble for suitable places to build their dams, uncivilized nations would suffer "righteous warfare" so that the more powerful could enjoy their seaboard, and scientific prophets would be laughed to scorn. But in ten thousand years' time, before any great project could be launched, scientists of all types would be consulted as a matter of obvious procedure.

Similar proportion-neglecting theories suggest that when man begins to bore into the earth for heat, he will destroy it by releasing molten rock to make a volcano far greater in power than any known to-day. This is only a variation of the eruption prophecy, and is not interesting other than for the moral question implied. Then there is the theory so popular with writers of Utopia, that man will build "robots" which will eventually destroy him. The impossibility of this state of affairs, however picturesque it may be for purposes of fiction, is evident, for will and brain do not agree. Disease could not, I think, destroy the entire population. However powerful certain new bacteria might prove, and however infectious the disease resulting from its introduction into the human body, with present knowledge and our rapid methods

of communication, we could prevent all spreading beyond a certain distance. A whole continent might be wiped out, but this is a small matter on the book of time, when even vegetable life can soon bring animals into being.

According to the theories of "accidental death," it is abundantly clear that the world may end to-morrow. But the most careful investigation leads us no further than this: that the world will probably end by the dying of the sun; that this is not likely to take place in less than a million years; and that, at the moment, this is no more than a geological period. Our greatest comfort should be that, in all probability, our children's children will have ample warning, that they will be sufficiently selfish to ensure continuance of the race in some form, and that by those distant years, they will have reached a state of callous self-sufficiency which beggars even astronomical description.

The relativity of all human thought is decidedly humiliating. We never know heat until we have felt cold, or grasp that one form of life is unimportant until we can believe in another. I have no faith in the end of any world. I believe that the unending circle of life cannot be broken. I believe that infinite time cannot be told by finite minds, and the destruction of one planet in an inconceivable universe is totally unimportant to what we fatuously define as our life upon this small earth.

CHAPTER XXIV

Summary

ONCE it can be agreed that everybody will think less and less about their bodies and more and more about their minds, we can see how they will eat, sleep, travel and think in the future. But why worry about what might happen to other people? It may be interesting, but why trouble? The answer is that most of our troubles are due to casuistry. Men, and particularly women, seldom play the game of consequences. One half the world is living in the present and the other in the past. In hard fact, the future is all that matters to us in work, play, happiness and life, whether we recognize it or not.

The boxer, no less than the chemist, realizes that anticipation is everything. To know what the next move is likely to be is to be prepared, and able to take advantage of another man's mistake. If the study of the future had been seriously undertaken a hundred years ago, we should not be twenty years behind the times. We look forward a little, sometimes, it is true, but usually to pleasures. We should develop the habit of thinking ahead and shaping our ends, rather than priding ourselves upon our skill in dodging troubles which could be foreseen.

Will the future make man, or man make the future?

In other words, are we going to be masters of our destiny, or are we going to "hope for the best"? The exact date upon which many of the things prophesied will come to pass depends very much on the efforts which are made to merge our rhythm with that of fate. We could, for example, make all the drastic alterations necessary to secure scientific and common-sense clothing to-morrow. But dress reformers are usually unrepresentative cranks, and it is not until every man and woman feels the essential need, that we shall throw our collars, waistcoats, studs, buckles and other paraphernalia into the dust-bin. It is not sufficient even to know that changes are necessary. We must want them ourselves. Modern man has no great capacity for mere sensation, or there would be no slums, no fogs and far less ill-health.

The first step towards creating the thought phase that can make us masters of the future is to grasp the nature of the unceasing and perpetual change to which all things are subject. It would be an achievement even to persuade the majority of people that everlasting change is everywhere, that nothing is constant, that houses, bodies, and books, are crumbling each moment as you read. It is your eyes that cannot see these things. To-day we look only to the immediate future, while new worlds are created each minute. Men spend years in studying the past for its own sake; when the only use of history is to point the way to the future, or to tell us how more useful things may be obtained with less effort. Age adds no intrinsic value to anything. The Portland vase, although it may be valued at a king's ransom, is less

useful than an aluminium picnic set. Those who made this ornament had no brains to deal with the mass production of cheap metalware. The fact that machines can make drinking cups is a great recommendation. Time is then available for something more spiritual than a dab of clay or a crudely-painted book.

The greatest discovery of science during the past decade is that we know nothing. The philosopher is often accused of being too sure. Dogmatism is the last thing which should infect a true scientist. He realizes that facts are dependent upon the number of people believing them to be true, that the theories of yesterday are the facts of to-day and that the marvels of this morning are next year's bedtime story. He investigates under the most rigorous conditions, yet would not assert that the eventual discovery is "fact." It was once considered a "fact" that the atom was the smallest particle of matter. Now we know that there may be a whole universe within the molecule. For convenience, we must accept facts as the average belief of a large majority; always with the reservation that we may be wrong. Just as the word "impossible" should not be found in any scientific vocabulary, so must truth depend upon the opinion of the believer. To-day's best is much too bad for to-morrow.

The future is not a matter of detail to those who are now living. It is to tendencies that we must look for results. We can construct curves on the basis of past events and project them into the future with an accuracy equal to that of many historical statements.

We know that, if used in the past, such curves might have altered the whole trend of civilization for the better. The technical data concerning the properties of hydrogen were known long before the mechanism for testing them existed; town planning has shown that it is possible to look ahead by reading the past, in a very practical manner. Tendencies are more interesting than events and much more important. The tendency for man to shirk brute strength and exertion should have shown car makers the necessity for servo brakes many years ago, and his unwillingness to make movements with levers should have resulted in the adoption of a universal gear long before the present time.

The greatest enemy of all future progress is prejudice. Even the broadest-minded man has strong prejudices and declares his disgust at the idea of ectogenesis, birth control, sex selection, or chamber music. Yet a study of the curve of life would demonstrate the inevitability of these things in our everyday affairs. Bigotry has brought so much damage to civilization in the past, that I fear for its monstrous effect upon the world of the future. Prejudice is a greater danger to civilization than armament manufacture, malaria or debt. It has retarded the growth of the railway, the bicycle, the aeroplane and the motor-car. It was responsible for the burning of witches on the evidence of ignorant children in an England which was less merrie for the public than is popularly supposed.

Fortunately, history shows that, although prejudicial manias may sweep a country, commonsense, or science, is successful in the end. Prejudice may be

a brake on the wheel of progress, but it cannot "switch off the power" at its source.

Some people fear the future, for a less logical reason than the ignorance with which others fear the dark. They speak so glibly of the "good old days" and profess to prefer horses, suitably unintelligent, to motoring. They cannot recognize a partial fact to less than one hundred years' standing, because they have never been taught to think connectedly. They will ask us to believe, for example, that life was happier when pigs slept beside their master; when disease and dirt were rampant. So many of us read of May-day festivals, and ignore the story of the Black Plague. We think it would be charming to journey in a coach, but would be indignant if the inn had no bath, or expected its guests to eat their meals from the floor. What is really wanted, of course, is twentieth-century comforts in eighteenth-century surroundings; which, as even Euclid would have realized, is absurd.

The scientist is instinctively suspicious of any movement incorporating in its title the words "Back to." Man should be thinking of the future and not too much of the dead. "Back to nature" is a meaningless phrase, for no one has ever managed to forsake nature. Science has triumphed, not by flouting nature in a miracle, but by understanding. To cure a leper by one touch would be a miracle at the present time. The scientist's method is to discover the cause of leprosy and then seek its remedy. But it may be that in the future the "miracle" will be understood as conforming to natural laws of

electricity and homeopathy. I cannot believe that a God brings greater goodness to bear by showing how his own laws could be broken rather than by proving how knowledge can make interpretation perfect.

Some hereditary tendency seems to make men hanker after what is generally called a "nature" movement. They satisfy a primitive passion when camping and cooking their own foods, but it would be wise to remember that the modern amateur gypsy does not lead a savage life. He talks about "back to nature," but carries matches or tinned foods in a car, and he always knows that if he is hungry when it begins to rain, there is a central-heated restaurant round the corner.

Whenever anyone talks to me about going back to anything, I always feel tempted to ask, "How far?" Are we to go back until just before the industrial revolution, or to the Middle Ages, or right back to the time when man was more than half ape? If the argument is that the simpler the existence, the greater the happiness, there should be no limit to the distance we "go back." But the idea that primitive peoples were "happy" is a fallacy. They were not so capable of feeling happy as modern man, because happiness is something relative which depends upon mental development. Aborigines felt neither their sorrows or their griefs to any appreciable extent.

It is small consolation to the "back to nature" enthusiast to be told that he would probably live for but a few days in his ideal state. If some plague did not sweep him off the earth, he would most certainly die of hunger or exposure. But these lovers of the

pseudo-antique want twentieth-century houses, complete with watertight roof and electric heating, in second-century forests. They forget that a small army of workmen are required to build and fit a modern home, and that for these workmen to live, the forest must be cleared.

It is more helpful to think forward, so that we can make the best of up-to-date conditions and prepare better times for our children, than to proclaim that savages were fine, cheery fellows, or that we should copy them. If half the energy and discussion now focussed upon people who wish to satisfy their secret passion for nudity were directed towards problems of the future, such as ridding the land of smoke, there would be less hankering after the life of Pan. We should aim at directing our thoughts in such a way that atavistic tendencies disappear, rather than recreating the conditions by which they were stimulated. Even the most ardent nudist might draw the line at gnawing a raw bone on the mat, but that seems the logical end of an argument which, by relegation of stomachs and hunting to the dust heap, omits all consideration of brain development.

I like to think of the past, present and future as interchangeable dreams of a broad river. The human race is paddling its canoe. We cannot see far into the future because of the bend, but we know from the contour of the hills that there will be rapids, waterfalls, sunken wrecks and, optimistically, a broad, smooth stretch leading to the promised land. We can either lie idle on our paddles, admiring the landscape behind us and discussing what we should or

should not have done at each difficult passage, or we can give our energy to the boat, while a man in the bow looks ahead for obstacles which can be avoided. The speed with which we progress to the promised land depends partly upon our efforts, but much more on the skill of the lookout. One single snag neglected and a century of backwater is the sure result.

That is the object of falling in love with the future rather than the past. Not interest in the future for the future's sake, but interest in the future for the sake of man. If we believe in humanity at all, and that is the finest faith, we shall try to think constructively in the certain knowledge that good thought lasts longer than anything in this world. The more we realize the pitiable savagery of our teeth, our nails, and our fish-like throats, the more we should care for the vastness of time to come, believing that by forethought we can smooth the way of those who follow. Our present understanding of the world compares unfavourably with that of a worm's knowledge of a modern religious ceremony. Thinking of the ideal future is some help to realization of the fact that to define the impossible, is the only impossibility within the universe.

